COCONUT RESEARCH BOARD

COCONUT RESEARCH INSTITUTE OF SRI LANKA

REPORT FOR 1984

COCONUT RESEARCH INSTITUTE – REPORT FOR 1984

COCONUT RESEARCH BOARD

REPORT OF THE

COCONUT RESEARCH INSTITUTE

FOR 1984

Editors

D.T.Wettasinghe, BSc Agric (Cey), PhD (Reading)

R.Mahindapala, BSc (Cey), MSc (Exon), PhD (Exon)

COCONUT RESEARCH INSTITUTE OF SRI LANKA (CEYLON)

LOCATION

The Head Office, Laboratories and Library of the Coconut Research Institute are situated at Bandirippuwa Estate, Lunuwila, 51 km from Colombo, 27 km from the Colombo International Air Port, Katunayake, 16 km from Negombo, 6 km from Dankotuwa, 5 km from Wennappuwa, and 3 kmfrom the Lunuwila Railway Station.

Sub Stations

(1) Ratmalagara Estate - 34 km from Head Office.

(2) Pottukulama Research Station - 61 km from Head Office.

(3) Isolated Seed Garden - 56 km from Head Office.

(4) Passekudah Research and
Demonstration Farm, Kalkudah - 296 km from Head Office.

(5) Walpita Estate - 37 km from Head Office.

VISITORS

Visitors are always welcome. The working hours are from 8.30 a.m. to 12.15 p.m. and 1.00 p.m. to 4.30 p.m. The Institute will be closed on Saturdays, Sundays and all Public Holidays. It is necessary to make prior arrangement regarding visits by letter.

Guest House facilities are available to those visiting the Institute, at reasonable rates. However, advance bookings are essential.

CORRESPONDENCE

All correspondence should be addressed to Director, Coconut Research Institute, Lunuwila, Sri Lanka (Ceylon). Telephone: 0315 - 300, 030 - 3795 Telegrams. 'Cocos' Negombo.

CONTENTS

Assistant Information Officer- P.A.Henry Nimal Bsc Agric (Cey)

THE COCONUT RESEARCH BOARD

as at 31 December, 1984

Dr. D.V.Liyanage *(Chairman)*

Dr. O.S. Peries

Mr. K.F.J.Perera

Mr. Naomal S Dias

Mr. P.R.Wijewardena

Mr. M.M.Razick

Mr. Merle E Dalpathado

Secretary to the Board - Mr.J.M.D.Jayaweera.

COMMITTEES OF THE COCONUT RESEARCH BOARD

(as at 31st December 1984)

1. The Research Committee

Dr. D.V. Liyanage *(Chairman)*
Dr. O.S. Peries
Mr. P.R. Wijewardene
Mr. W.K.D.J. Waragoda
Mr. Vincent Jayasuriya
Mr. T.K.G. Ranasinghe
Dr. D.T. Wettasinghe
Dr. R. Mahindapala *(Convenor)*

2. The Administrative Committee

Mr. K.F.J. Perera *(Chairman)*
Mr. Naomal S. Dias
Mr. D.Y. Liyanage
Dr. D.T. Wettasinghe
Mr. J.M.D. Jayaweera *(Convenor)*

3. The Estates Committee

Mr. Naomal S. Dias *(Chairman)*
Mr. X. Jobin
Dr. D.T. Wettasinghe
Dr. R. Mahindapala
Mr. Vincent Jayasuriya
Mr. P.S. Liyanagama *(Convenor)*

COCONUT RESEARCH INSTITUTE OF SRI LANKA

THE STAFF*

(as at 31st December 1984)

DIRECTORATE

Director

D.T. Wettasinghe, BSc Agric (Cey), PhD (Reading)

Deputy Director (Research)

R. Mahindapala, BSc (Cey), MSc (Exon), PhD (Exon)

Deputy Director (Administration & Finance)

J.M.D. Jayaweera, BA (Cey), SLAS

RESEARCH DIVISONS

Soils and Plant Nutrition Division

Head	-	M. Jeganathan, BSc (Lond), MPhil (Lond)
Soil Scientist	-	R.T. Shanmuganathan, BSc Agric (Cey) PhD (Australia)
Assistant Soil Scientists	-	Miss M.B.M.N. Dias, BSc (Cey) K.S. Jayasekera, BSc (Cey) ** L.L.W. Somasiri, BSc (Cey) N.A. Tennakoon, BSc Agri (Cey)
Senior Technical Assistants	-	T.W. Fernando G.D. George B.J.A.F. Mendis
Technical Assistants	-	N.P. Gunaratne Miss S.D. Hemamala Miss S.M. Jayasuriya Miss G.S. Jayatilaka

* When more than one officer is listed under a designation, the names appear in alphabetical order.

** On overseas study leave

		D.P. Panditharatne
		U.S.S. Perera
		Miss S. Periyathamby
		Mrs. N.H.R.M. Silva, BSc (Cey)
		Miss D.M.D.I. Wijebandara
Lab and Field Assistants	-	A.M.P. Attanayake
		A. Albert Fernando
		P.J.E. Fernando
		P.M. Harischandra
		K. Murugiah
		K.V.W. Silva
		B.C.E. Perera
		S.A. Peiris
		E.M.A. Thilakaratne Banda
		D.S. Wijetunga
Typist	-	Mrs. W. Sriyani Athauda

Genetics and Plant Breeding Division

Head	-	Miss M.R.T. Wickramaratne, BSc (Cey) PhD (Lond), DIC
Assistant Botanist	-	K.R.R.A. Peiris, BSc Agric. (Cey)
Seed Production Officer	-	P. Kariyawasam, Dip. Agric.
Technical Assistants	-	Miss. M.A.S. Fernando
		Mrs. W.B.S. Fernando
		M.H.L. Padmasiri
		H.P.P.H. Pathirana
Lab and Field Assistants	-	H. Bandappuhamy
		M.H. Dharmadasa
		M.H. Karunadasa
		T.M.W. Peiris
		A.M. Ranasinghe Banda
Clerk/Typists	-	K.A. Ariyadasa
		B.R. Fernando

Isolated Seed Garden

Manager	-	W.M.J. Karunaratne, Dip. Agric.
Lab and Field Assistants	-	W.T.H.C. Fernando U.V.M. Fernando M. Victor
Clerk/Typist	-	R.P. Victor

Agronomy Division

Head	-	Mrs. L.V.K. Liyanage, BSc Agric (Cey) MSc (Australia)
Assistant Agronomists	-	D.N.S. Fernando, BSc Agric (Cey) H.A.J. Gunathilake, BSc Agric (Cey) M. de S. Liyanage, BSc Agric (Cey) MSc (Australia)
Senior Technical Assistant	-	M. Bastian
Technical Assistants	-	H.A. Abeysoma M.H.F.G. Ivan Appuhamy M.J.I. Costa R. Marasinghe A.M.U. Wijerathne
Lab and Field Assistants	-	D. Amarasinghe J.M.S.N. Appuhamy W.S.M.A. Fernando M.D.V. Saparamadu B.D. Benet Silva W.E.J. Tissera
Clerk/Typist	-	A.A.D.N. Athauda

Crop Protection Division

Head	-	P. Kanagaratnam, BSc Agric (Cey) PhD (Lond), DIC
Assistant Crop Protection Officers	-	Miss L.C.P. de Silva, BSc Agric (Cey) P.A.C.R. Perera, BSc (Lond), MSc (Lond), DIC
Experimental Officer	-	V. Shivanandarajah, BSc (Cey)

Senior Technical Assistants	-	J.K.F. Keerthisinghe J.L.J.G. Pinto
Technical Assistants	-	Miss I. Alwitigala K.S. Chandrasiri K.F.G. Perera M.S. Velu
Lab and Field Assistants	-	Premalal Abeywickrama W.E.A. Fernando W.W.S.J. Fernando D.M. Jayakody

Coconut Processing Research Division

Officer-in-Charge	-	P.A.N. Ratnayake, BSc (Cey)
Senior Technical Assistant	-	P.A.D.G.A. Appuhamy
Technical Assistants	-	Miss P.K.K. Croos H.P. de Soyza A.H. Norman G.C. Perera K.L.G. Perera Mrs. K.C.P. Perera W.H.Warnasiri
Lab and Field Assistant	-	L.W. Theodore
Clerk	-	Mrs. A.W. de Silva

Biometry Unit

Officer-in-Charge	-	D.T. Mathes, F.I.S. (Lond), BSc (Cey), Dip. Stat. (Vidyodaya), Dip. Biometry (Reading)
Assistant Agricultural Economist	-	M.A. Thilakasiri, BSc Agric (Cey)**
Assistant Biometrician	-	T.S.G. Peiris, BSc (Cey)**
Senior Field Assistant	-	E. Ranjith Fernando

Lab and Field Assistants	-	A. Dassanayake W.E.R.C. Fernando W.M.L.G. Fernando W.B.P. Fernando P.J.C. Fernando U.T.G. Fernando D.T. Fernandopulle W.K.M.K. Herath J. Wijedasa A. Wilson
Clerk/Typist	-	Mrs. D.M.T. Perera

Botany Unit

Officer-in-Charge	-	R. Mahindapala, BSc (Cey), MSc (Exon), PhD (Exon)
Botanist	-	Mrs. S.M. Karunaratne, BSc (Cey), MSc (Qld)
Assistant Botanists	-	V.U. de S. Jayasuriya, BSc (Cey), MSc (Cey) Mrs. C. Jayasekera, BSc (Cey)**
Technical Assistants	-	Miss K.D. Cecily Miss C.K. Gamage Miss R.K.I.A.S. Perera R.D.N. Premasiri
Lab and Field Assistants	-	W.H.N. Jayatissa

Publication, Documentation and Library Unit

Officer-in-Charge	-	P.A. Henry N. Appuhamy, BSc Agric (Cey)
Librarian	-	M.J.C. Perera, ALA
Senior Technical Assistant (Photography)	-	D.B. Hettiarachchi
Artist	-	D.W. Hapuarachchi
Clerk/Typist	-	R.A.L.C. Fernando
Printing Machine Operator	-	W.G.L. Rodrigo

Coconut Information Centre

Project Leader	-	M.J.C. Perera, ALA
Documentation Officer	-	Miss P.A.S.F. Caldera
Documentation Assistant	-	D.B. Jayasinghe
Library Assistant	-	Miss T.I.I. Peiris

Extension

Extension Officer	-	S.M.P. Subasinghe, BSc Agric (Madras)

ADMINISTRATION

Deputy Director (Administration & Finance)	-	J.M.D. Jayaweera, BA (Cey), SLAS

Establishment

Administrative Officer	-	M.D.R.A.M. Senanayake, BA (Cey)
Personnel Officer	-	Miss W.C.P. Fernando, Attorney at Law
Office Assistant	-	J.E.A. Dalpathado
Supplies Officer	-	M.A. Somadasa
Secretary to the Chairman	-	Mrs. T.M.H. Fernando
Stenographers (English)	-	Mrs. M.J. Ariyadasa Miss B.G. Mallika Piyaseeli Mrs. S.Z. Zuhair
Clerk/Typists	-	T. Gunadasa J.D. Ratnasekera W.A.W. Wijesuriya
Clerks	-	C.B.B.P. Fernando Miss P.C.A. Fernando Miss H.D. Mangalika
Receiptionist/Telephone Operator	-	Miss L.M.N. Janz

Accounts

Chief Accountant	-	R.M.G.D. Rajapakse
Accountant	-	D.R.C.M. Handalage, B.Com. (Cey)
Assistant Accountant	-	D.G. Manamudali, BA (Cey)
Book Keepers	-	B.M. Jayathilaka Banda Miss W.A. Chandrawathie Mrs. D.M.R. Fernando A.S. Nanayakkara Mrs. K.M.A. Nonis T.M.S. Peiris
Store Keeper	-	M.B. Upali
Shroff	-	P.A. Nonis
Head Clerk	-	R.H. Bennet Silva
Clerk/Typists	-	D.M.C.B. Dissanayake P.M.J. Fernando Mrs. M.R. Fernando Mrs. A.R.S. Hettiarachchi C. de S. Jayasinghe Mrs. C. Munasinghe Mrs. J.K. Fatima Perera Mrs. C.M.B.I. Salwathura D.G.M. Weerasinghe Y.H. Wijesena
Clerks	-	R.D. Dayasena H.M. Dharmasena D.M. Dingiribanda K.P.W. Perera Mrs. P.M.C.M.G. Rodrigo W.M.S. Wijetunge

Engineering

Officer-in-Charge	-	M.D.R.A.M. Senanayake, BA (Cey)
Foreman (Electrical)	-	M.D. Bernard Fracsides
Foreman (Mechanical) (Acting)	-	M.D. Bernard Fracsides
Foreman (Buildings)	-	R.M. Dayaratne

Draftsman	-	Miss R.N.S. Ratnayake
Clerk/Typists	-	P. Daluwatta K.D. Jathiratne
Transport Clerk	-	R.M. Dissanayake
Clerk	-	A.I.F. Fernando
Senior Mechanic	-	L.D.M. Fernando

Internal Audit

Internal Auditor	-	W.C.N. Fernando
Checking Officer	-	P.R. Fernandopulle
Internal Audit Clerks	-	M.R.U. Attanayake Miss M.M.J.R. Fernando Miss R.D. Indrawathie
Typist	-	Miss W.J.M.D.M.A. Dias

ESTATES, SUB STATIONS

Estate Management Division

Manager (Estates)	-	P.S. Liyanagama, BSc Agric (Cey)
Superintendent	-	M.R.S. Fernando
Clerk/Typists	-	P. Premarathne Fernando, BA (Cey) W.P.R.R. Fernando Mrs. N.R. Marasinghe S.M.H. Samarasinghe, BA (Cey)

Bandirippuwa Estate

Officer-in-Charge	-	U.L.P.A. Perera
Field Assistants	-	E.M. Gunaratne Banda W.L.B. Silva
Field Assistant (Nursery)	-	E.W.A.G. Gunasinghe
Field Assistant (Dairy)	-	J.M.S.N. Appuhamy
Clerk/Typist	-	H.H.J.E. Appuhamy

Ratmalagara Estate

Superintendent	-	D.M. Pathirage
Field Assistants	-	P.P. Jayasundara M. Sisira Perera

Pottukulama Research Station

Officer-in-Charge	-	T.H.L. Peiris
Field Assistant	-	B.A.L. Mendis

Walpita Estate

Officer-in-Charge	-	N. Gamage

Kirimatiyana Estate

Officer-in-Charge	-	K.P.C. Fernando

Isolated Seed Garden

Please see under Genetics & Plant Breeding Division.

Makandura Seed Garden

Officer-in-Charge	-	M.R.L. Perera

Passekudah Research and Development Farm

Assistant Manager (Farms)	-	A. Thavaratnarajah

Minneriya Research and Development Farm

Assistant Manager (Farms)	-	K.P. de Silva

Uhana Research and Development Farm

Field Assistant	-	P. Abeywickrama

REPORT OF THE DIRECTOR

D.T. Wettasinghe, Ph.D

1. COCONUT RESEARCH BOARD

The membership and attendance at meetings are reported below. The death of Mr. Percy Wickremanayake in February is recorded with deep regret. Mr. Merle E. Dalpathado was appointed to the Board in April.

Dr D.V. Liyanage	*(Chairman attendance 10/13)*
Dr O.S. Peries	*(Attendance 9/13)*
Mr K.F.J. Perera	*(Attendance 12/13)*
Mr Naomal S. Dias	*(Attendance 13/13)*
Mr Percy Wickramanayake	*(Upto February attendance 1/1)*
Mr M.M. Razick	*(Attendance 3/13)*
Mr P.R. Wijewardene	*(Attendance 10/13)*
Mr Merle E. Dalpathado	*(from April, Attendance 8/10)*

Dr. Liyanage, Chairman was away from the island for 3½ months from 12 August. Mr. K. F. J. Perera was appointed Acting Chairman and chaired the 154th, 155th and 156th meetings of the Board.

Altogether the Board held 13 meetings during the year. With the exception of the July meeting (151st), which was held at the Passekudah Research and Demonstration Farm, the meetings were held at the Coconut Research Institute, Lunuwila.

Mr. D. Y. Liyanage, Asst. Secretary participated in eight meetings and Mr. M. A. Warnakulasuriya in one meeting during the year under review as the representatives of the Ministry of Coconut Industries.

1.1 Committees of the Coconut Research Board

1.1.1. Research Committee

The Research Committee held three meetings (including field visits on two occasions) to monitor and review the implementation of the new research programme.

During the course of the year, the Committee made a very valuable contribution in guiding the research staff in their difficult efforts of establishing a large number of field experiments in a relatively short period of time.

The attendance at the meetings is given below. Mr. K. F. J. Perera, Acting Chairman at the time, chaired the meeting held on 21 September.

Dr. D.V. Liyanage	*(Chairman, attendance 2/3)*
Mr. K.F.J. Perera	*(Acting Chairman, attendance 1/1)*

Dr. O.S. Peries	*(Attendance 0/3)*
Mr. P.R. Wijewardene	*(Attendance 3/3)*
Mr. W. K.D.J. Waragoda	*(Attendance 2/3)*
Mr. Vincent Jayasuriya	*(Attendance 3/3)*
Mr. T.K.G. Ranasinghe	*(Attendance 1/3)*
Dr. D.T. Wettasinghe	*(Attendance 3/3)*
Dr. R. Mahindapala	*(Convenor, attendance 3/3)*

1.1.2 Administrative Committee

The Administrative Committee met four times during the year to consider matters referred to it by the Board. The attendance is as follows:

Mr. K.F.J. Perera	*(Chairman, attendance 4/4)*
Mr. Naomal S. Dias	*(Attendance 4/4)*
Mr. D.Y. Liyanage	*(Attendance 2/4)*
Dr. D.T. Wettasinghe	*(Attendance 3/4)*
Mr. M.M. Razick	*(Invited for the third meeting)*
Dr. R. Mahindapala	*(Convenor for the first two meetings attendance 2/2)*
Mr. J.M.D. Jayaweera	*(Convenor, attendance 2/2)*

1.1.3 Estates Committee

The Estates Committee held one meeting during the year. The attendance is as follows:

Mr. Naomal S. Dias	*(Chairman, attendance 1/1)*
Mr. Percy Wickramanayake	*(Did not attend)*
Mr. X. Jobin	*(Did not attend)*
Dr. D.T. Wettasinghe	*(Attendance 1/1)*
Dr. R. Mahindapala	*(Did not attend)*
Mr. Vincent Jayasuriya	*(–do–)*
Mr. P.S. Liyanagama	*(Convenor, attendance 1/1)*

2. DIVISIONS OF THE COCONUT RESEARCH INSTITUTE

2.1 General

The Institute embarked on a new five year research programme comprised of the following high priority projects:

1. Studies on the improvement of soil organic matter status and water holding capacity.

2. Rehabilitation of low yielding plantations.

3. Studies on establishment and management of new plantings/replantings.

4. Field Management Systems.

5. Production of improved coconut varieties.

6. Production of high quality seeds and seedlings.

7. Studies on the nutrient requirement of coconut, particularly under stress conditions.

8. Population dynamics of the pest/parasite complex of the coconut caterpillar.

9. Evaluation of systemic insecticides for the control of foliar pests of coconut.

10. Studies on the pests of coconut inflorescence and developing fruit.

11. Biological control of Black beetle.

12. Reduction of wastage in domestic consumption of coconut as a cooking medium.

13. Desiccated coconut from unseasoned nuts and development of by-products.

14. Coconut timber technology.

15. Use of off-cuts of timber and coconut shells as a source of energy.

16. Studies on the physiology of the coconut palm.

17. Studies on the premature decline of palms.

18. Studies on the vegetative propagation of coconut.

19. Application of biometry in coconut research.

Under this programme about 75 experiments were initiated. A considerable number of experiments was established in JEDB lands. The first half of the year was devoted to site selection, soil surveys, site preparation and other attendant activities. Where appropriate, pre-treatment yield records were taken. Twentyfive experiments from the previous research programme were continued.

2.2 Agronomy Division

Some of the field trials on intercropping with perennial crops, commenced in the late seventies, were concluded during the year.

Varietal studies of coffee at different levels of fertilizers indicated that CC-I, C-III and GCR are the most suitable varieties for intercropping. CC-I showed drought tolerance and appears to be suitable for the Intermediate Zone of the coconut triangle. Both variety x fertilizer and density x fertilizer studies indicated that 350 g of fertilizer (Urea 4: Rock phosphate 5: Muriate of potash 3: Kieserite 1) plant/ year are adequate for coffee under coconur. The optimum density of coffee under coconut is 1037 plants/ha of coconut, planted in two rows in each coconut avenue.

The cacao variety x fertilizer study demonstrated that the local selection Millawana is the best variety for the Wet and Intermediate Zones of the coconut triangle. As for coffee, 350 g of fertilizer (Urea 4: Rock phosphate 5: Muriate of potash 3: Kieserite 1)/plant/year was adequate for cacao under coconut. Nitrogen was essential for early flowering.

Mixed cropping models with coffee, cacao and pepper demonstrated the agronomic and economic feasibility of these systems under coconut. Intercropping with cacao and coffee in the Wet Zone significantly increased coconut production. Rotation with annuals using leguminous crops such as winged bean and bushitao also increased coconut yields. Intercropping pepper and cloves had no effect on coconut yields while cinnamon had a beneficial effect. All these trials clearly indicated that both the intercrops and coconut should be fertilized separately for optimum production.

Twentyone new experiments on soil/moisture conservation, rehabilitation of low yielding plantations, establishment and management of replantings/new plantings and field management systems with coconut/pasture/livestock were commenced during the year. In the evaluation of cover crops under coconut *Mucuna utilis* was found to be very effective in completely covering the ground within two to three months of establishment. Others such as *Macroptilium atropurpureum, Pueraria phaseoloides* and *Calopogonium mucunoides* also formed effective ground covers within a period of about six months.

2.3 Genetics and Plant Breeding Division

The division started 16 experiments under the new research programme. Twelve experiments from the earlier research programme were continued. Progress made in the implementation of the new research programme was generally satisfactory.

Self pollination of varieties which had been attempted several times in the past with little success was successfully completed and the first nuts harvested and laid in the nursery. Over 250 cross pollinations of selected tall, dwarf green and San Ramon parents in different combinations were carried out at the Isolated Seed Garden, Ambakelle. Pollen processing techniques were modified and updated resulting in an appreciable increase of the quantity of pollen collected per inflorescence.

The trial for the evaluation of five different cultivars was successfully established at three sites in different agro climatic zones. Trials on the East Coast were well maintained until about mid year after which visits to this region were not possible, due to the disturbance in the area.

Nursery trials showed that slicing of seed nuts prior to laying did not have any clear advantage and would merely increase costs. Also it was found that identification of the broadest surface of the nut prior to laying was no longer necessary. This would increase speed of seed nut laying, thereby reducing nursery costs considrably.

Much progress was made in the planting programme of the Isolated Seed Garden at Ambakelle. Replanting of field No. 5 with selected dwarf green and Tall from Ambakelle was completed and that of fields 12 and 13 (using Tall from Ambakelle) begun. Most of the construction work of the irrigations system at the Isolated Seed Garden was completed, and commissioning the system remains to be done.

A total of 3,145,198 seednuts were selected during the year, of which 3 million were supplied to the Coconut Cultivation Board nurseries. Although the supply of blocknuts was given up in 1983 it had to be temporarily resumed in order to meet the ever increasing requirement of the Coconut Cultivation Board which is well over the recommended national replanting target of 2%. The plus palms pool was increased from 41,492 to 46,056.

Pollination programmes have been intensified on both JEDB and private estates and over 300 ampoules of pollen were issued to them during the year.

2.4 Soils and Plant Nutrition Division

The emphasis of the research undertaken by the Division was changed to study the nutrient requirements of coconut in relation to the physical, chemical and biotic properties of the soil, and also to determine cheap and efficient manure/fertilizer mixtures. Seven field experiments were commenced under this new programme. Six field experiments from the earlier research programme were continued.

The new experiments were designed to study the rate of supplementation of organic manure with inorganic fertilizers to formulate a manure/fertilizer mixture for coconut, to study the K-Mg interaction on the yield of coconut, to resolve field problems of widespread Mg deficiency and to study the role of Na, Cl, K, Mg, and S in the nutrition of coconut.

A systematic approach to determine fertilizer requirement of coconut, using soil/leaf analysis, was also initiated at estate and small holder levels. Work on sampling schemes to determine the optimum sample size required for soil and leaf sampling, was completed. The joint CRI/CCB/FAO study on increasing yields of small holdings by the popularization of the use of fertilizer and other related inputs was brought under this project.

Available methods for estimation of sulphur were evaluated. These studies showed that high performance liquid chromatography was most appropriate for rain water, nut water (ashed extracts) and soils, and turbidimetry for leaf samples. The sixth leaf was found to be the most suitable for determining the sulphur nutrition status. In field studies, this methodology was used to correlate the concentration of leaf sulphur to applied sulphur in soil. Rain water analysis for sulphur confirmed the availability of adequate sulphur in the atmosphere to meet the requirements of the plant.

During the year 3062 soil samples, 2327 leaf samples and 230 fertilizer samples were analysed for various parameters.

2.5 Crop Protection Division

Under the new research programme, 10 new experiments were commenced. The long term experiments were conducted satisfactorily.

Preliminary studies to evaluate techniques of application of systemic insecticides yielded promising results with root feeding technique and trunk injection. In some instances, the insecticidal effect persisted for about six months. Wetting of the crowns of *Oryctes* damaged palms with organophosphorus insecticides resulted in the reduction of pest attack.

A survery of insects of coconut inflorescence and developing fruits showed that mite infestations were common. It was noted that some varieties of coconut were more tolerant to mite damage than others. Studies undertaken to examine the feasibility of using the pathogens, *Baculovirus oryctes, Metarhizium anisopliae* and *Rhabditis* sp were continued satisfactorily. Mortality of the Black beetle larvae in the field due to *B. oryctes* and *M. anisopliae* was observed.

Infestations of the coconut caterpillar *Opisina arenosella* Walk were observed in several estates in the Western, North Western, Southern and Eastern Provinces. Mass rearing and release of parasites were continued. The introduced parasite of the coconut caterpillar, *Antrocephalus pandens* could not be recovered from the field.

An infestation of *Promecotheca cumingi* was reported from an estate in the North Western Province. This infestation was eventually brought under control by the parasite, *Dimmockia javanica.*

2.6 Coconut Processing Research Division

The division could not implement fully the research programme due to lack of staff. Several trials were suspended.

Results of the trial on the manufacture of desiccated coconut (DC) from unseasoned nuts were conveyed to the Coconut Development Authority, with the recommendation that the millers be permitted to process fresh nuts for desiccated coconut.

A beverage with an agreeable taste was processed from nut water of fresh mature nuts. Citric acid and sodium citrate solutions were used to lower the pH of the nut water and cane sugar was added as sweetening agent.

Different firing schedules were tried on processing white copra in the Sri Lanka Standard Copra Kiln using coconut shell charcoal as fuel. Sulphur was burnt in the first fire to make the copra whiter than estate copra. 145 kg of shell charcoal was found to be adequate to dry 2000 split nuts.

A number of trials was carried out on drum kilns to investigate the flame propagation pattern within the kiln and recovery.

2.7 Botany Unit

A grant amounting to nearly Rs. 3.0 million was received from the United States Agency for International Development for work on the culture of leaf explants of coconut *in vitro*.

Coconut seedlings were produced *in vitro* from excised embryos of the three colour forms of the dwarf variety, *nana*. Investigations were carried out to establish these seedlings in soil. Significant progress could not be achieved in the culture of shoot apical tissues of coconut. A medium which induces callusing and subsequent rooting in tender leaf explants has been developed. Further experiments were commenced to 'refine' this medium and to identify the critical ingredients.

Investigations were commenced to induce embryogenesis in the haploid tissues of anthers. Callus formation was observed in the anther wall tissues.

The experiment to study the effect of growth hormones on the formation of vegetative propagules on inflorescence shoot was continued. No visible changes were observed in the treated palms.

A sample survey involving about 18,000 ac was carried out to assess the incidence of premature decline of palms. The highest incidence (over 2%) of tapering was observed in lands which received no fertilizer, while it was lowest (0.6%) in lands receiving organic and inorganic fertilizers. When the entire coconut triangle was considered, the overall incidence of tapering was found to be very low (less than 1%).

2.8 Biometry Unit

Activities relating to agricultural economics were transferred to the Agronomy Division.

The unit continued to assist the research divisions in designing field experiments, analysis and interpretation of data. On the new research programme, the unit assisted other divisions in designing 38 new experiments. Yields were also recorded in 19 experiments, having 5169 palms, on behalf of the research divisions.

The three Agri-Meteorogical stations at Bandirippuwa, Ratmalagara and Isolated Seed Garden were maintained satisfactorily. Analysis of rainfall data indicated a well-spread higher rainfall during the first half of the year. 1985 can be expected to be a good crop year.

2.9 Estate Management Division

The phasing out of commercial coconut nurseries was completed with the handing over of the nursery at Colombo to the Coconut Cultivation Board in November, and closing down of the nursery at Ratmalagara Estate at the end of the year. The nursery at Bandirippuwa Estate was maintained for research purposes and to raise seedlings for the replanting programme of the Institute's estates.

Work on the setting up of two new seed gardens at Maduru Oya and Makandura was commenced. The dairy at Bandirippuwa Estate, earlier managed by the Agronomy Division was taken over.

Routine field operations such as manuring, weeding, husk burying etc. were carried out on all plantations. The general condition of the estates was improved. An area of 40 ac was underplanted during the year using CRIC 60 seedlings.

2.10 Publications, Library and the Coconut Information Centre

The Editorial Board for extension publications was reconstituted, and two issues of the journal (Pol Pawath and its english and tamil translations) devoted to Drought and Crop Protection were issued in June and December respectively.

A handbook on coconut cultivation was also published during the year.

The Institute participated in the "Gam Udawa, 1984" exhibition at Anuradhapura.

The Coconut Information Centre continued to function while awaiting funding from the IRDC (Canada). The Centre continued to collect information on all aspects of cultivation and technology. Literature surveys were carried out where necessary.

The Retrospective Bibliographical Series (No. 3) was prepared. The Newsletter COCONIS was published on schedule.

2.11 Administration Division

The total expenditure during the year was Rs. 15.5 million.

With the assistance of the Sri Lanka Institute for Development Administration (SLIDA) a training course on office procedures was conducted for the clerical staff. A short course of training on management skills was conducted for the executive staff. The preparation of salaries of the entire monthly paid staff of the Institute was computerised.

FOREIGN-AIDED PROJECTS

3.1. East Coast Rehabiliation Project

Work at the *Passekudah Farm* could not be carried out on schedule due to the disturbances in the area. The general performance and growth of seedlings in the experimental areas were reported to be very satisfactory.

At the *Minneriya Farm*, work could not progress on schedule due to lack of water. The coconut plantations suffered badly due to regular visits by wild elephants.

At the *Uhana Farm*, too, difficulties were encountered due to lack of water. As investigations revealed that adequate amount of water could not be had, and therefore no useful research or demonstration work would be possible, it was decided to hand over the farm to the Coconut Cultivation Board.

An area of approximately 85 ha was demarcated in Mahaweli System 'B', Block 104 for the purpose of establishing a coconut seed garden to produce Tall x Tall (CRIC 60) variety.

3.2 Coconut Development Project

Under this project, improvements to infrastructural facilities were undertaken at the CRI. During the year, construction of a further 16 houses were completed, thereby making available 52 housing units under the project. Construction work of the laboratory building was continued. Other work which continued during the year are:

(i) Construction of 100,000l overhead water tank, provision of new water sources and a reticulation system.

(ii) Augmentation of electricity supply at Bandirippuwa Estate and replacement of overhead and building wiring.

(iii) Supply of a PABX system.

The irrigation systems installed at the Isolated Seed Garden could not be commissioned due to defects. Preliminary arrangements were made to select a consultant to get the defects rectified.

Work at the Makandura Seed Garden progressed satisfactorily. Planting of the Seed Garden proper (81½ ac.) using Ambakele Tall was completed in November. Work in the barrier area is proceeding and the planting of the entire Seed Garden would be completed by June, 1985.

4. FIELD DAYS, SEMINARS

A Field Day was held at the Isolated Seed Garden, Ambakele for small holders from Puttalam District.

A quarterly seminar series was organized for the benefit of planters from the JEDB, CCB, NLDB and Regional Managers of the CCB. During the year three seminars on Drought, Crop Protection and Fertilizer Usage were held.

A press conference was held to popularize efficient methods for domestic use of the coconut kernel. A demonstration followed the conference.

5. VISITORS

The Hon. Minister of Plantation Industries, Major Montague Jayawickrema visited the Institute on 5 December.

The Hon. Minister of Coconut Industries, Mr. Harold Herat accompanied Her Excellency Mrs. Olga Chamero Trias, Ambassador for the Republic of Cuba in Sri Lanka visited the Institute on 9 April.

6. STAFF MATTERS

The complete list of staff changes is given in the Report of the Administration Division.

6.1 Overseas Training

Dr. P. Kanagaratnam attended the "Interregional training course on the use of isotopes and radiation in integrated pest management with special reference to the Sterile Insect Technique" at the University of Florida, U.S.A. from 11 June to 3 August.

Mr. B. J. A. F. Mendis left the island on 12 September on a F.A.O fellowship for a six month training at the Paddington College, London.

Mr. A. H. Norman attended a training course on Coconut Wood Utilization at the Zamboanga Research Centre, Philippines from 11 August to 15 September.

Mr. D. B. Jayasinghe attended a training course on "Abstracting, keyword use, maintenance of selective dissemination of information profiles and preparation of special bibiliography" at Central Food Technological Research Institute, Mysore, India from 7 January to 4 March.

The following officers continued their post-graduate training:

Mr. T. S. G. Peiris, University of Cantebury, New Zealand.
Mr. M. A. Thilakasiri, Australian National University, Canberra.
Mr. K. S. Jayasekera, University of Queensland, Australia.
Mrs.Chitrangani Jayasekera, University of Queensland, Australia.

6.2 Overseas Visits

Dr. D. T. Wettasinghe participated in a study tour to Bangladesh, Indonesia, Thailand and The Netherlands with the Sri Lanka Agricultural Research Project Preparation Team from 25 July to 20 August.

Mrs. L. V. K. Liyanage attended the International Conference on Soils and Plant Nutrition of Perennial Crops from 13 to 15 August held in Kuala Lampur, Malaysia.

6.3 Participation of CRI staff in other Statutory Bodies, Committees etc.

The following CRI staff members continued to serve the Boards/Committees as indicated:

Dr. D. T. Wettasinghe

- Member, Board of Directors, National Institute of Plantation Management.
- Member, Board of Directors, Sri Lanka Cashew Corporation.
- Member, Board of Management, Postgraduate Institute of Agriculture, Peradeniya.
- Member, Agricultural and Food Products Divisional Committee – Sri Lanka Standards Institution.
- Member, Board of Study in Crop Science, Postgraduate Institute of Agriculture.

Dr. R. Mahindapala

- Member, Formulary Committee on Pesticides, Ministry of Agriculture.
- Member, Working Committee on Biological Sciences, Natural Resources, Energy and Science Authority of Sri Lanka.
- Member, Drafting Committee on Pesticides, Sri Lanka Standards Institution.
- Member, Faculty Board, Sri Jayawardenepura University.
- Member, Plant Quarantine Committee.

Mr. M. Jeganathan

— Member, Fertilizer Co-ordinating Committee of the National Fertilizer Secretariat.

— Member, Agricultural Committee, Atomic Energy Authority.

— Member, Technical Advisory Committee, Ceylon Fertilizer Corporation.

— Member, Drafting Committee on Fertilizer, Sri Lanka Standards Institution.

Mrs. L. V. K. Liyanage

— Member, Pasture Research Committee, Ministry of Rural Industrial Development.

REPORT OF THE AGRONOMY DIVISION

Head - L.V.K. Liyanage, M.Sc. Agric. (U.N.E.)

GENERAL

Dr. M.N.M. Ibrahim, Research Officer, resigned from his post on 25th January.

The management of the dairy was handed over to the Estate Management Division in April. Mr. R. Marasinghe, Technical Assistant (Animal Husbandry) and Mr. G.D. Benjamin, Calf Keeper, remained in the Division while the other dairy staff were transferred out.

RESEARCH PROJECTS

Project 1 : Studies on the improvement of soil organic matter status and water holding capacity.

Experiments 1.1.1 to 1.1.4 : Evaluation of creeping and bush cover crops for coconut lands with special emphasis on plant characters and the effect on physical and chemical properties of the soil (Joint study with Soils & Plant Nutrition Division).

Leguminous cover crops play a significant role in soil moisture conservation in coconut lands. Cover cropping coconut lands provides multiple benefits such as control of weeds, and improvement of physical, chemical and biological properties of the soil. The performance and effects of cover crop species can vary according to soil and climatic factors. Therefore, this experiment was set up to evaluate a number of cover crops in different soil types and climatic zones with special emphasis on the plant characters and their effect on soil properties.

Treatments :

Creeping covers

T_1 - *Pueraria phaseoloides* (Puero)
T_2 - *Centrosema pubescens* (Centro)
T_3 - *Calopogonium mucunoides* (Calopo)
T_4 - *Calopogonium caeruleum*
T_5 - *Macroptilium atropurpureum* (Siratro)
T_6 - *Mucuna utilis (Wanduru-me)*
T_7 - *Desmodium ovalifolium*
T_8 - *Dolichos lablab*
T_9 - *Canavalia ensiformis* (Awara)
T_{10} - *Psophocarpus palustris* (Winged bean cover)

Bush covers

T_{11} - *Crotolaria juncea* (Sun hemp)
T_{12} - *Leucaena leucocephala* (Ipil-Ipil)
T_{13} - *Gliricidia maculata*
T_{14} - *Tephrosia vogelli* (Boga medella)
T_{15} - Control – no cover

Design : Randomized block with four replicates.

Locations 1.1.1 : Bandirippuwa Estate, Lunuwila (Intermediate Zone, Sandy soil).
1.1.2 : Walpita Estate, Kotadeniyawa (Wet Zone, Lateritic gravel soil).
1.1.3 : Heenmaliagara Estate, Dummalasuriya (Intermediate Zone, Lateritic gravel soil).
1.1.4 : St. Johns Estate, Mangala-eliya (Dry Zone, Loamy sand soil).

The cover crops were planted at the four sites as follows :

1.1.1 : Bandirippuwa Estate - Yala, 84 (Except for T_4, T_8 and T_{14} planted in October, 84).
1.1.2 : Walpita Estate - Yala, 84 (Except for T_4 planted in October, 84).
1.1.3 : Heenmaliagara Estate - Maha, 84
1.1.4 : St. Johns Estate - Maha, 84

Sunhemp was incorporated into soil upto 9" (23 cm) when it was in full bloom in mid September. Measurements on the improvement of soil nutrient status and physical structure are to be taken six months after incorporation.

Observations and data collected on establishment and early growth are presented in Table 1. Establishment was assessed 30 days after sowing. The established seedlings were counted and expressed as a percentage of the seeds sown.

Creeping covers such as Mucuna, Siratro, Puero and *Calopogonium mucunoides* established well and covered the land rapidly at all the sites. All four bush covers also appear to do well at the four sites. Sunhemp however, needed very careful attention from planting upto incorporation into soil because of its high susceptibility to pests and diseases.

L. V. K. Liyanage, R. T. Shanmuganathan

Experiment 1.2 : Effect of NPK and Mg on the early growth and nutrient uptake of Pueraria phaseoloides grown under coconut - 1984.

Little information is available on the manurial requirements of cover crops grown under coconut. Since manuring is one of the key factors in the establishment and maintenance of covers under coconut, this experiment was set up in Yala, 1984 with the most commonly used cover crop, *Peuraria phaseoloides* under coconut.

Table 1. *Establishment and early growth of cover crops at four sites.*

	Approx. % establishment by end of first month				*Other observations upto six months after planting*						
	Bandirippuwa estate	*Heenmaliagara estate*	*Walpita estate*	*St. Johns estate*	*Growth rate/Cover*	*Root system*	*Leaf litter*	*Nodulation*	*Seed production*	*Pest & diseases*	*Remarks*
Creeping covers											
Mucuna utilis	90	90	90	90	V. rapid growth covers the ground in 12 months.	Roots upto 4" - 6"	Very large amount	Large nodules	Satisfactory		No rooting node still very effective cover of one meter height.
Siratro	90	90	90	90	Rapid growth covers in 3 months	Deep tap root upto 2'	Large amount	Large no. of nodules	V. high		Many rooting nodes appear to be a v. effective cover.
Pueraria phaseoloides	70	80	80	70	Early growth slow. Dense cover by 5th month.	Surface roots upto 6 - 8"	Large amount	Large no.	Nil		Many rooting nodes appear to be v. effective at later stages.
Calopogonium mucunoides	65	60	60	50	Early growth slow. Complete cover by 6th month.	Surface roots upto 6 - 8"	Large amount, but less than above three	Large no.	V. high		Many rooting nodes v. effective after six months.
Calopo caeruleum	85	85	85	85	Slow growth. Rate of covering also slow. (Cover performance good at H/E)	Deep roots upto 10 12"	Nil at 3 months	Large no.	Nil		Although establishment is good, does not cover effectively.
Dolichos lab lab	85	85	85	85	Early growth fast, but covering % less.	Surface roots upto 6"	Nil at 3 months	Large no. not effective	Moderate	Susceptible	Covering ability is somwhat less.
Centrosema pubescens	50	70	70	50	Early growth v. slow till about 5th-6th month.	Deep roots upto 8 - 10"	Moderate amount	Large no.	Moderate		Performance in sand not good. Good cover after six months in heavy soil.
Desmodium ovalifolium	50	65	60	50	Initial growth v. slow. But completely covers by 6th month.	Surface root upto 6"	Moderate amount	Large no. of tiny nodules	V. high		Although initial growth is slow, appear to be an effective cover.
Canavalia ensiformis	50	–	50	75	Rapid growth and covers completely by 5th month.	Profuse rooting upto 2 m.	Moderate amount	Large nodules all not effective	Satisfactory		Covering ability good, root invasion to manure circle
Psophocarpus palustris	30	35	30	55	Early growth & covering very poor.	Moderate rooting	Nil	Small no.	Moderate	V. susceptible	Seed lot received does not appear to be *Psophocarpus palustris* true to type.
Bush covers											
Sun hemp	90	90	90	95	Rapid growth rate	Deep roots upto 8 - 10"	Small amount	Large no. of small nodules	V. high	Susceptible	Attention v. necessary in early stages due to high susceptibility to pest and diseases.
Tephrosia vogelli	90	90	70	90	Early growth upto 3 months slow.	Surface roots upto 6"	Small amount	Large no. of small nodules	Nil	Susceptible	
Ipil-Ipil (Seedlings)	100	100	100	100	Rapid growth rate.	Deep tap root upto 1½ m.	Nil	Large no.	V. few.		04 plants at B/E 02 plants at W/E in flowring (under high light intensity.)
Gliricidia	70	70	90	90	Slow growth rate.	Surface roots	Nil	Large no.	Nil		

Treatments:	N kg/ha	0 - 0
	(as Urea (46% N))	1 - 35
		2 - 70
	P_2O_5 kg/ha	0 - 0
	(as TSP (48% P_2O_5)	1 - 40
		2 - 80
	K_2O kg/ha	0 - 0
	(as Muriate of Potash	1 - 60
	(60% K_2O)	2 - 120
	MgO kg/ha	0 - 0
	(as Keiserite 26% MgO)	1 - 25
		2 - 50

Design: 3^4 factorial, confounded block design with nine blocks.

Location: Ratmalagara Estate, Madampe (Sandy clay loam soil)

The experiment is in progress.

L. V. K. Liyanage, A. M. U. Wijerathne

Experiment 1.3 : Effect of green manuring practices on the improvement of organic matter and water holding capacity of soil (Joint study with Soils & Plant Nutrition Division).

The following treatments are being tested in a factorial experiment.

A. Cover crops: 1. *Leucaena leucocephala*
2. *Gliricidia maculata*
3. Control (no cover)

Lopped periodically and incorporated into the manure circle.

B. Fertilizer levels:

1. No fertilizer.
2. 3.0 kg per palm of CU_1.

Design : 3 x 2 randomized block with 3 replications; 9 palms per plot.

Location : Muthugala Mahawatte, Dambadeniya (Lateritic gravel soil).

Soil and leaf samples of coconut were collected for analysis.

Bush covers will be planted in Yala, 1985.

L. V. K. Liyanage, R. T. Shanmuganathan

Experiment 1.4 : Effect of planting sunhemp on the improvement of organic matter and water holding capacity of soil (Joint study with Soils & Plant Nutrition Division).

This trial was designed to examine the feasibility of using sunhemp to recondition coconut soils. The treatments being tested are:

T_1 - No sunhemp; no fertilizer for coconut (control)
T_2 - No sunhemp; 2.0 kg per palm of CU_2
T_3 - Sunhemp (mulch); no fertilizer for coconut
T_4 - Sunhemp (mulch); 2.0 kg per palm of CU_2
T_5 - Sunhemp (Incorp); no fertilizer for coconut
T_6 - Sunhemp (Incorp); 2.0 kg per palm of CU_2

Design : Split plot factorial design with levels of fertilizer as main effects and sunhemp (mulching/incorporation) and no sunhemp as sub treatments with 4 replicates.

Location : Kiniyama Estate, Bingiriya.

Soil and leaf samples from coconut were collected for analysis. Sunhemp will be planted in Yala, 1985.

R. T. Shanmuganathan, L. V. K. Liyanage

Experiments 1.6.1 and 1.6.2 : Effect of three frequencies and two depths of ploughing on the performance of coconut.

These trials were established to study the effect of tillage on moisture conservation and related soil properties as well as on the performance of coconut.

Treatments:

1. Frequencies of ploughing - 12 month intervals
   24 month intervals
   36 month intervals
2. Depths of ploughing - 15 cm
   25 cm
3. Control

Design : Randomized block design with three blocks; 12 coconut palms per plot.

Locations : 1.6.1 Heenmaliagara Estate, Dummalasuriya (Intermediate Zone, Lateritic gravel)

1.6.2 Jacintha Estate, Palawi (Dry Zone, Sandy soil)

The ploughing treatments were imposed in November at both sites. Table 2 shows the number of primary roots/palm damaged by ploughing. The number of primary roots damaged was higher in gravel soil. This may be due to the high surface rooting in gravel soil compared with sandy soil. In gravel soil there was no significant difference in the number of primary roots damaged between the two depths tested. In sandy soil, more roots were damaged with deep ploughing.

H.A.J. Gunathilaka, M.J.I. Costa

Experiment 1.7 : Effect of four methods of placement of husks and coir dust on moisture conservation (Joint study with Soils & Plant Nutrition Division)

There is an urgent need to adopt soil moisture conservation measures in coconut lands in drier areas. Husks and coir dust are by products of coconut which can be used for this purpose. These materials have the ability to absorb and retain moisture received during rains and thereby reduce adverse effects of drought. This experiment was established to study the effect of burying husks and coir dust in pits and trenches, on the nut yield.

Treatments :

1. Control
2. Husks in pits 3 x 1.8 x 0.45 m
3. Husks in circular trenches 2 m away from base 0.45 x 0.45 m
4. Coir dust in pits 3 x 1.8 x 0.45 m
5. Coir dust in circular trenches 2 m away from base 0.45 x 0.45 m

Design : Randomized block design replicated five times. Each plot consists of 12 palms.

Location : Shanthil Estate, Pallama (Deep sandy soil in the Dry Intermediate Zone).

During the year records on nut yields, copra weight, number of female flowers and immature nut fall were maintained.

The experiment is in progress.

M. de S. Liyanage, M.N. Dias

Table 2. * *No of primary roots damaged by ploughing*

Treatment	*Jacintha Estate (Sandy soil)*	*Heenmaliagara Estate (Gravel soil)*
Control	Nil	Nil
F_1D_1	5.50	26.75
F_1D_2	11.25	21.75
F_2D_1	9.0	19.50
F_2D_2	16.50	26.0
F_3D_1	6.25	22.75
F_3D_2	13.25	24.0
LSD (P = 0.05)	5.27	7.75
Sig.	*	n.s.
CV%	35.20	22.70

* The number of primary roots damaged in a 2 feet length of furrow, at a distance of 6 ft. from the bole of the palm.

F_1 - 12 month interval ploughing frequency

F_2 - 24 month interval ploughing frequency

F_3 - 36 month interval ploughing frequency

D_1 - 15 cm ploughing depth.

D_2 - 25 cm ploughing depth.

Experiment 1.8 : Comparison of husk and coir dust on moisture conservation (Joint study with Soils & Plant Nutrition Division).

Treatments :
1. Control
2. Husks in pits 3 x 1.2 x 0.45 m
3. Coir dust in pits 3 x 1.2 x 0.45 m

Design : Randomized block with 7 replications. Each plot conists of 6 palms.

Location : Ratmalagara Estate, Madampe (Lateritic gravel in Dry Intermediate Zone)

During the year records on nut yields, copra weight, female flower production and immature nut fall were maintained.

The experiment is in progress.

M. de S. Liyanage, K.S. Jayasekara

Experiments 1.9.1 and 1.9.2 : Effect of different methods of placement of husks on moisture conservation.

Treatments :
1. Control
2. Husks in pits 2.4 x 1.2 x 0.9 m arranged alternately along coconut rows, 2 m away from palms.
3. Husk and coir dust mixed with soil in pits 2.4 x 1.2 x 0.9 m arranged alternately along coconut rows, 2 m away from palms.
4. Husks in pits 1.2 x 1.2 x 1.9 m on both sides of each palm along rows 2 m away from palms.
5. Husks in pits 1.2 x 1.2 x 0.9 m on one side of each palm along coconut rows 2 m away from palms.
6. Husks in trenches 1.2 m wide 0.9 m deep along alternate avenues between coconut rows 2 m away from palms.
7. Husks and coir dust mixed with soil in trenches 1.2 m wide 0.9 m deep along alternate avenue between coconut rows 2 m away from palms.
8. One layer of husk placed 30 cm away from base upto 2 m.

Design : Randomized block design with 3 replicates.

Locations : 1.9.1 : Kiniyama Estate, Bingiriya (Lateritic clay soil in Wet Intermediate Zone)
1.9.2 : Jacintha Estate, Palawi (Sandy soil in Dry Zone)

These experiments commenced in November, 1984. The pre-experimental records of the nut production, copra weight, stem girth at the top, number of fronds and female flowers were kept during the year.

M. de S. Liyanage

Project 2 : Rehabilitation of low yielding plantations.

Experiment 2.1 : Effect of various cultural practices on the performance of low yielding palms - 1984.

Palms growing on sandy soils, particularly with a calcarious hard pan, often show a stunted growth mainly as a result of the low fertility status and poor moisture retention capacity of the soil. In such situations, a regular programme of cultural practices along with effective soil and moisture conservation methods could improve the performance of low yielding palms. This experiment was set up to study the effect of various cultural practices on the improvement of nut production of low yielding palms in sandy soils.

Treatments :

1. Husk burial-recommended practice (8' x 4' x 3').
2. Establishment of a cover (Puero) on husk pits – to be incorporated into soil once a year.
3. Mulching with vegetative material (Gliricidia supplied from outside) around the base of the palm.
4. Harrowing in between coconut rows once a year.
5. Control.

Two levels of fertilizer for coconut (with and without fertilizer) will be repeated in each treatment.

Design : Randomized block with 3 replications.

Location : Jacintha Estate, Palawi (Dry Zone - sandy soil)

This experiment was set up in November, 1984.

D.N.S. Fernando

Experiment 2.2 : Effect of cultural operations designed to induce root formation on the rehabilitation of low yielding plantations.

The low coconut yields of certain mature palms could be the result of a poor root system with the most active absorption zones being very much restricted around the palm. In such situation fertilizer application will have little effect on the yield of palms. This experiment was set up to study the methods by which the development of new roots could be induced and active root zone expanded around the base of the palm.

Treatments :

1. Open up ¼ circle trench (30 cm width x 30 cm depth) 30 cm away from the bole of palm and filled with green manure (Gliricida and Ipil)
2. Open up ¼ circle trench and filled with goat dung.
3. Open up ¼ circle trench and filled with fertile soil.
4. Open up ½ circle trench and filled with green manure.
5. Open up ½ circle trench and filled with goat dung.
6. Open up ½ circle trench and filled with fertile soil.
7. Open up full circle trench and filled with green manure.
8. Open up full circle trench and filled with goat dung.
9. Open up full circle trench and filled with fertile soil.
10. Open up full circle trench and filled with the same soil.
11. Control.

Design : Randomized block with 3 replications.

Location : 2.2.1 : Heenmaliagara Estate, Dummalasuriya (Intermediate Zone - Lateritic soil)

2.2.2 : Puwakwatta Estate, Kotadeniyawa (West Zone, Lateritic gravel)

This experiment was set up in November, 1984.

D.N.S. Fernando

Project 3 : Studies on the establishment and management of new plantings/replantings.

Experiment 3.1 : Effect of shade crops on the establishment and growth of coconut seedlings in the Intermediate Zone.

In this study catch crops would be established one year before replanting to evaluate their effect on the establishment and growth of coconut seedlings.

Treatment :
1. Ipil Ipil established one year before planting.
2. Gliricidia established one year before planting.
3. Banana established one year before planting.
4. Control.

Design : Randomized block design with six replications: Each plot with 12 palms.

Location : Kirimetiyana Estate, Lunuwila.

Clearing and land preparation for planting were completed by the end of the year. Planting of catch crops will be done in Yala, 1985.

M. de S. Liyanage

Experiment 3.2 : Quantitative study of the light distribution pattern in replanted/newly planted coconut plantations using the quantum sensor.

Among the range of short term food crops that could be grown successfully in a young coconut plantation, grain legumes play a vital role in providing an effective ground cover during the rainy season and maintaining the soil fertility, by adding nitrogen and organic matter to the soil. Due to the seasonal nature of grain legumes, they will not compete with coconut for soil moisture and plant nutrients. However, the shade cast by the tall coconut canopy could alter the growth and yield performance of grain legumes. It is therefore necessary to study the distribution of light beneath the coconut canopy of different ages (Experimet 3.2), as well as to determine the relative effects of varying shade levels on the yield of grain legume species (Experiment 3.3).

Treatments :	Age of plantation	Season
	1. Soon after transplanting	1. Dry season
	2. 1 year after transplanting	2. Wet season
	3. 4 years after transplanting	
	4. 7 years after transplanting	

5. 10 years after transplanting

Several sites at Bandirippuwa, Ratmalagara, Walpita, Poththukulama and Ambakelle were selected to represent different age groups for light measurements under the coconut canopy.

M. de S. Liyanage

Experiment 3.3 : Quantitative study of the relative yields of grain legumes grown under different shade levels.

Treatments :	Varieties	Shade levels (Artificial)
	1. Cowpea	1. No shade
	2. Mung bean	2. 30% shade
	3. Soy bean	3. 50% shade
		4. 70% shade
		5. 80% shade

Design : 3 x 5 factorial randomized block design with 2 replicates.

The experiment was commenced in 1984 at Bandirippuwa estate. Results of the preliminary trials showd that three mung bean varieties (Vc 1482 c, selections 77-262, CES ID-21), three cowpea varieties (Bombay cowpea, Lanka Kadala and TE-570) and one variety of Soybean (Pb-1) performed well under shade.

M. de S. Liyanage, H.A. Abeysoma

Project 4 : Studies on field management systems.

Experiment 4.1 : Utilization of animal husbandry for optimization of coconut production.

Available information suggests that a mixed cropping system using pasture/livestock under coconut has agronomic and economic advantages over a monocrop of coconut. Therefore, a mixed cropping system is being established in a one ha plot of coconut in order to evaluate its performance, and to serve as a demonstration as well. This experimental model is designed to increase coconut production/productivity by adopting soil/moisture conservation practices and also by economising in the use of inorganic fertilizer by integration of livestock into the system.

The following programme would be implemented.

1. Soil and moisture conservation practices. Husk burial 3.12 x 1.25 x 0.94 m (10' x 4' x 3') trench system in between coconut palms.

2. Establishment of *B.miliiformis* and *Pueraria phaseoloides*, in alternate rows 0.625 m (2') apart.

3. Establishment of Ipil-ipil (single row) 2 m (6') apart in the coconut avenue and Gliricidia/Ipil planting 1 m apart along the fences.

4. Grazing with animals (Stocking rate 4 animals/ha).

Burying of husk, planting of *B.miliiformis* and *Pueraria phaseoloides*, Ipil-ipil and Gliricidia were completed in Maha, 1984. Basal dressings of phosphate and potash fertilizers were applied to the grass and legumes while in addition cowdung was applied to Ipil and Gliricidia.

The area is blocked into 5 paddocks, each consisting of 24 palms. Each paddock will be grazed with 4 animals for 6 days. Rotational grazing management practice will be adopted (stocking rate 4 animals/ha). During the monsoons when there should be enough feed the animals will be allowed to grase the whole day and tethered to coconut trees during the night. At the end of the grazing period in paddock, animals would be tethered to each of the 24 palms. Then the animals are moved to the next paddock and the same procedure adopted. After all five paddocks are grazed, grazing will again start from paddock 1.

At the end of the monsoon and during drought periods, the animals will be allowed to graze for a limited period of time depending on feed availability and for the rest of the time animals will be kep tethered to a coconut palm. Rice straw will be fed ad lib, supplemented with 750 - 1000 g (dry weight) of Gliricidia or Ipil per animal during this period. Except rice straw, no other animal feeds will be introduced. Rotation of animals from paddock to paddock every 6 days and rotation of animals from palm to palm every day would be practised. At all times animals would have ready access to drinking water.

Location : Bandirippuwa Estate, Lunuwila.

D.N.S. Fernando, R. Marasinghe

MISCELLANEOUS EXPERIMENTS

AGRO 2.1 : Demonstration of integrated farming system in coconut lands at Dambuwa Mukalana Estate, Nattandiya (IRDP, Puttalam District).

The coconut plantation was maintained satisfactorily during the year and recorded a yield increase of 19 nuts/palm/year over the previous year. The growth of the young plantation remained vigorous and flowing was observed in a few palms. The coconut crop of 22047 nuts gave an income of Rs. 56,974.80 during the year. which represents more than a two fold increase over the previous year as a result of improved nut yield combined with favourable prices. The average yield of the plantation as a whole is very satisfactory, giving 80 nuts/tree/year. The total expenditure for field work amounted to Rs. 119,600/-.

The first pick of coffee was taken during the year and cacao and citrus plants have come into bearing. Banana, pineapple, brinjal, sweet potato and colocasia performed well under coconut. From the intercrops a sum of Rs. 5,989/- was realised which is an increase of 10% over the previous year. Papaw, cinnamon, banana, ponegranate, guava, ginger and turmeric crops were established. In addition to the cropping programme, beekeeping and inland fish culture were maintained for demonstration purposes.

AGRO 4.1 : Effect of three levels of fertilizer application on the growth and yield of 10 coffee selections grown under coconut at Bandirippuwa Estate - 1977.

Coffee yield data clearly indicate that the Arabica selections (K7, S5 and B072) are not suitable for cultivation in the Intermediate Zone of the coconut triangle (Table 3). Among the Robusta varieties GCR, C111, CC1 and C36 gave the highest yields while GCR was significantly better than the presently recommended S274 variety. There was no significant difference in yield between the levels of fertilizer. CC1 was the least affected by drought.

This experiment was terminated.

H.A.J. Gunathilaka, M.J.I. Costa

AGRO 4.2 : Effect of three levels of fertilizer on four cacao selections grown under coconut at Walpita Estate - 1977.

Cacao bean yield differences between selections were not significant and there was no response to levels of fertilizer. Variety Millawana showed the best drought tolerance.

H.A.J. Gunathilaka, M.J.I. Costa

AGRO 4.3 : Effect of three planting densities and three levels of fertilizer applications on the growth and yield of coffee and their effect on the production of coconut at Walpita Estate - 1977.

There was no significant differences in the coffee and coconut yields between treatments.

The experiment was terminated.

H.A.J. Gunathilaka, M.J.I. Costa

AGRO 4.4 : To study the agronomic and economic feasibility of growing cacao, coffee and pepper together as mixed crops under coconut at Walpita (Mixed cropping model - 1) 1977.

The yield data from the mixed crop model are given in Table 4.

Table 3. *Yield of coffee (g/tree/year) intercropped with coconut*

Selections	*Yield g/plant/yr. (average of the three fertilizer levels)*
GCR	397.6
IMY	127.5
C-36	250.1
CC-1	265.8
S-274	230.4
C-96	239.4
K-7	49.4
S-5	2.0
BO-72	30.8
LSD (P = 0.05)	= 119.5

Table 4. *Yield and production data from the mixed cropping model-1 at Walpita in the 7th year*

Crop	*No. of plants planted*	*No. of plants in production*	*Yield per plant (in mixed model)*	*Yield per plant (grown seperately with coconut)*
Coconut	24	24	70.4 nuts	51.0 nuts
Cocoa	48	48	455.6 g.	423.5 g.
Coffee	98	35	136.0 g.	202.0 g.
Pepper (on gliricidia)	81	81	602.0 g.	710.1 g.
Pepper (on coconut palms)	24	24	135.0 g.	205.0 g.

The yields of cacao and pepper (on gliricidia stakes) in the mixed cropping model, and when they are individually cultivated under coconut are similar. Coffee and pepper vines (on coconut palms) gave lower yields in mixed cropping campared with mono cultivations under coconut. In the mixed cropping model the growth of coffee plants were adversely affected by their close proximity to vigorously growing cacao plants. Nut yield of coconut increased by 38% in the mixed cropping model compared with the rest of the area in the estate.

The production of coconut, cacao and pepper (on gliricidia stakes) in the mixed crop model was very satisfactory.

H.A.J. Gunathilaka, M.J.I. Costa

AGRO 4.6 : Effect of intercropping perennial crops and rotation of annual crops on the yield of coconut at Sirikandura Estate, Dodanduwa - 1978.

Yields of coconut over the period 1978 to 1983 and in 1984 are given in Table 5. The annual crop planted during the year was Bushitao.

During the year, coconut intercropped with coffee and cinnamon gave significant higher nut yields over the control where no intercrops were grown. In the plots with coffee nut yields showed a significant increase for the last four year period. Although the cinnamon plots gave the lowest coconut yields in 1982 due to Mg deficiency, application of kieserite to cinnamon as well as for coconut remedied the deficiency, resulting in an increase in yield in 1983 and thereafter.

H.A.J. Gunathilaka, M.J.I. Costa

AGRO 4.8 : To study the agronomic and economic feasibility of growing cacao and pepper together as mixed crops under coconut at Walpita (mixed cropping model 2) - 1979.

Sixty two percent of cacao plants came into production this year. Pepper on gliricidia stakes, which was introduced to this model in 1983, did not grow vigorously. Pepper on coconut palms gave unsatisfactory yields due to the competitive effects from coconut. There was no difference in the coconut yields between the trial area (48.1 nuts/palm/year) and the rest of the estate (51.0 nuts/palm/year).

H.A.J. Gunathilaka, M.J.I. Costa

AGRO 4.9 : Effect of four levels of N and five levels of K on the growth and yield of cacao inter cropped with coconut at Walpita - 1981.

Nitrogen had a significant effect on flowering of cacao with 70% of the trees in flower at 100 kg N/ha and 28% at zero N.

H.A.J. Gunathilaka, M.J.I. Costa

Table 5 : *Effect of various intercrops on yield of coconut.*

Treatment	*Average yield of nuts/ha/year (1978-83)*	*Yield of nuts/ha (1984)*	*Copra Yield/ nut (1984)*
Control (no intercrops)	5171	4667	239.0
Cocoa	6501	5285	240.0
Coffee	7183	6400	237.0
Pepper	5389	4726	229.6
Cloves	5752	4843	230.9
Cinnamon	7337	6661	231.7
Rotation with annuals	6837	5051	224.6
LSD (P = 0.05)		1472	80.6
Sig.		*	n.s.
VC%		15.4	6.2

Table 6. *Percentage of flowering, bearing and yield due to the effects of N & K levels.*

N & K levels	*% of flowering*	*% of bearing*	*Bean yield/tree (g)*
N_0	28	15	nil
N_1	65	42	45.0
N_2	71	57	71.6
N_3	65	50	100.6
K_0	50	33	48.9
K_1	61	48	42.3
K_2	44	23	35.9
K_3	69	44	74.5
K_4	67	56	70.0
LSD (P = 0.05)	43.4	42.4	–
Significance	***	***	–
N	n.s	*	–
K	n.s	n.s	–
N & K	n.s	n.s	–
CV%	35.8	49.6	–

AGRO 6.3 : Effect of shade cropping and mulching on the establishment and growth of coconut seedlings at Passikudah - 1982.

As in the previous years the growth of coconut seedlings was best in the plots mulched with salvinia. As a mulch illuk weed trash was superior to paddy husk. All the coconut seedlings in the Ipil ipil plots died.

L. V. K. Liyanage

Visits, lectures and symposia

Several training programmes were conducted for students from Hardy Institute and the National Apprenticeship Board. Lectures were also given for trainees from the National Institute of Plantation Management. Mr. H.A.J. Gunathilaka conducted several lectures on "Intercropping on coconut lands" to officers of Walpita Agriculture Training School and Rubber Training Centre at Agalawatte. Mr. D.N.S. Fernando delivered a talk on Intercropping to the officers of Agricultural Development Authority at Peradeniya.

Mrs. L.V.K. Liyanage participated at the International Conference on Soils and Plant Nutrition of Perennial crops in Kuala Lumpur, Malaysia from 13th - 15th August, 1984. She presented a paper on "Effect of liming on the establishment and early growth of a grass legume mixture grown under coconut".

Publications

Gunathilaka, H.A.J., and P.D.B. Silvan (1984). Varietal evaluation of winged bean (*Psophocarpus tetragonolobus* L.Dc) under coconut for the Intermediate dry zone of the coconut triangle in Sri Lanka. *Journal of National Agric. Society of Ceylon, 20.*

Gunathilaka, H.A.J. (1984). Weed control in coconut lands. *Coconut Bulletin 1* (2).

Liyanage, L.V.K. and M. de S. Liyanage (1984). *Leucaena leucocephala* as a shade tree in young coconut plantation – *Leucaena Research Report V.* (1984)

Liyanage, M. de S. (1984). Measures for satisfying the vital need of increased coconut production. – *Journal of National Inst. of Plantation Management 3.* (2) : 146 - 153.

Ibrahim, M.N.M. and M. de S. Liyanage (1984). Studies on Root and Tuber crops grown in association with coconut 2. Efficiency of calcium carbide and leaves of *Croton aromaticus* and *Avorrhoa bilinbi* in breaking dormancy of Dioscorea yams. *Cocos. 2* : 1 - 9.

Papers presented at conferences

Liyanage, M. de S. (1984). Manioc as a potential intercrop under coconut. Root and Tuber Crops Seminar organised by the Sri Lanka Association for the advancement of Science (Section B), July, 1984.

Liyanage, L.V.K. and W.E.J. Tissera (1984). Effect of liming on the establishment and early growth of grass legume mixture grown under coconut. International Conference on Soils and Plant Nutrition of Perennial Crops. Malaysia, 13 - 15th August, 1984.

Liyanage, L.V.K. (1984). Weeds and weed control in coconut lands. Conference on Weeds organised by the Sri Lanka Association for the Advancement of Science (Section D), September, 1984.

REPORT OF THE GENETICS & PLANT BREEDING DIVISION

Head - M.R.T. Wickramaratne, Ph.D

GENERAL

Mr. P. Kariyawasam was appointed as Assistant Seed Production Officer and assumed duties on 15 October.

Mr. W.B. Dunstan Fernando, Seed Production Officer retired from service as from 18 July and Mrs. V.K.R.S. Perera, Research Assistant, resigned with effect from 24 December.

Mr. M.R.L.A. Perera, Field Assistant, presently released for service at Makandura Seed Garden under the Estate Management Division, was promoted to Operative Grade Class 1 and Mr. U.R. Annesley Fernando, Field Attendant, was promoted to Minor Grade Special Class.

RESEARCH PROJECTS

Project 5 - Production of improved coconut varieties.

Experiment 5.1 (G3.10) Evaluation of existing cultivars (1983).

The selection of locations, for this experiment was finalized and are Bandirippuwa Estate, Lunuwila, (block no. 4) of the CRI, Thammenna Estate, Puttalam (field no. 2) of JEDB and Dambakanda Estate, Kurunegala (field no. 4) of JEDB.

Seednuts laid in late 1983 were raised in polybags at Bandirippuwa Estate. Planting which was originally planned at 26 feet equilateral triangular was changed to 7.6 m (25 feet) equilateral trinagular approximating to 198 palms per ha (80 palms/acre), in keeping with the new recommendations on planting density. The size of seedhole was 1 x 1 x 1 m (3 x 3 x 3 feet). The work programme at the three sites in summarised in Table 1.

Table 1. *Work programme at the three sites of the trial for evaluation of cultivars.*

	Operation	*Bandirippuwa*	*Thammenna*	*Dambakanda*
1.	Site selection	October 1983	March 1984	July 1984
2.	Lining	May 1984	July	August
3.	Opening of seed holes	May	Sep./Oct.	Oct./Nov.
4.	Closing of seed holes	October	November	December
5.	Planting out	Oct./Nov.	December	December.

The seedlings were mulched with coconut husks and aldrex 20 was applied as a preventive measure against termite attack.

The seedlings have established well at all three sites but damage by cattle presents a problem at some locations.

R.R.A. Peries

Experiment 5.2 - (G1.1) Identification of parent palms for use in the breeding programme – Response of genotypes to year-to-year changes in weather (1982).

Tall palms – There appears to be clear evidence for the existence of genotype-environment interactions, particularly because ranking of the palms on the basis of yield performance often varies from year to year. It was not possible to establish this by an analysis of variance due to the inability to replicate the palms. However mean yield over years and regression coefficients (*b* values) as well as husked nut weights and agronomic characters were used in the selection of superior palms. Since it was not certain whether the *b* value could be used, variance of yield (number of nuts) over years was also calculated and this was found to have a high correlation with the *b* value. Thus, stability of yield as measured by *b* value or by variance over environments (years) generally identified the same genotypes.

Dwarf green palms – Due to the distinct seasonal bearing character of dwarf palms, it was felt that linear regression techniques may not be applicable here. Initial selections were based on mean yield (number of nuts) and lowest and highest yields achieved considering seven to nine years date of fields 5 and 9. Rejections were then made on husked nut weights and agronomic characters during the drought of 1983. A total of 29 palms were selected, details of which are given in Table 2.

Table 2. *Dwarf green palms at the Isolated Seed Garden, Ambakelle, identified for use in the breeding programme.*

Field no. 5		*Field no. 9*			
Serial No.	*Field plan no.*	*Serial No.*	*Field plan no.*	*Serial No.*	*Field plan no.*
5.1	3477	9.1	8883	9.13	9567
5.2	3569	9.2	8894	9.14	10097
5.3	3570	9.3	8954	9.15	10158
5.4	3593	9.4	9078	9.16	10160
5.5	3649	9.5	9121	9.17	10213
5.6	3714	9.6	9256		

5.7	3729	9.7	9288
5.8	3777	9.8	9300
5.9	3802	9.9	9310
5.10	3830	9.10	9311
5.11	3831	9,11	9404
5.12	3833	9.12	9483

Dwarf yellow palms – Data for dwarf yellow palms on field 10A were tabulated for the period 1980 to 1983. Yields during 1980 averaged only 5 nuts per palm. Since a minimum of four years yield data is preferred and yields in 1980 were extremely low, it was decided to await 1984 data for palm selection.

M. R. T. Wickramaratne, V. K. R. S. Karunaratne and W. B. S. Fernando

Experiment 5.3 - Pollen processing - To improve techniques of collection, processing and storage of coconut pollen (1983)

Several refinements in techniques of collection have been introduced in order to minimise contamination and increase the quantity of pollen collected per inflorescence. Inflorescences are forced open just before natural opening and bagged for 6 days prior to pollen collection. Insecticide sprays are used to minimise insect damage and bags are used for transportation from field to laboratory. Pollen manipulation boxes have been introduced for the stripping of male flowers and dissection of anthers. The single sieve of guage 150 μ for separating pollen grains from flower debris has been replaced by a set of sieves (guages 400 μ and 150 μ) with lid and collecting pan. The quantity of pollen collected per inflorescence has been appreciably increased by these modifications of technique.

Negotiations are in progress for obtaining more upto date equipment such as freeze drier, fluid bed drier, flower strippers and flower crackers.

M. R. T. Wickramaratne, M. H. L. Padmasiri and W. B. S. Fernando

Experiment 5.4 - Pollination of selected palms at the Isolated Seed Garden, Ambakelle, in different combinations and evaluation of the progeny (1984).

During April and May a total of 18 inflorescences on selected tall palms were pollinated using pollen from tall palms; a minimum of 100 seednuts are expected to result.

From August, dwarf green and San Ramon pollen were also availabe for use in the programme. Forty four selected tall palms on fields 1 and 2 were categorized into three subgroups of 15 (or 14) each, at random. Palms in each subgroup were pollinated using mixed tall pollen, mixed dwarf green pollen and mixed San Ramon pollen respectively. A total of 238 pollinations were successfully carried out upto the end of the year.

The 29 selected dwarf green palms were also categorized into three subgroups of 10 (or 9 palms) each and will be crossed with the same three categories of pollen as above, starting in 1985.

M. R. T. Wickramaratne and M. H. L. Padmasiri

Experiment 5.5 - Establishment of germplasm collections (1983).

Negotiations were started for importation from Indonesia of the seed material as recommended by the Consultant in Breeding.

Collections from local sources had to be postponed due to staff shortages and pressure of work. A series of controlled pollinations was carried out on the varieties block at Bandirippuwa and on the Dwarf palms block at Ratmalagara with a view to establishing new blocks for conservation of this genetic material.

Some *rathran thembili* palms were located in a private garden in Colombo and arrangements made to obtain seed material. This variety is not represented in our blocks at present. The nuts resemble the form *aurantiaca* in colour but have a distinct pink coloration in the proximal region, similar to *ranthembili*. A dwarf yellow palm at the Isolated Seed Garden, Ambakelle, was also found to show this pink coloration on the base of the nut and has been termed *rankaha kundira*. Self pollinated nuts from this palm will be used in the variety collection.

M. R. T. Wickramaratne and M. H. L. Padmasiri

Experiment 5.6 - (G8.2) Isolation of genotypes showing drought tolerance (1983).

This trial was proposed by the Consultant in Breeding and the method is described in his Report No. IV. Sources of seednuts for testing were increased to four and are listed below:

1. Korai Group, fields nos. 1 and B - unselected block nuts.
2. Korai Group, field C - 16 selected palms.
3. Marvadiodai estate, Marnkerni - 10 selected palms.
4. ISG, Ambakelle - Ambakelle special palms.

As a result of the adverse climatic conditions of the preceding year seednut yields were low and it was not possible to obtain sufficient quantities of seednuts for this trial from just one pick. Seednuts were, therefore, laid in two instalments in March and June, totalling 2700, 243 and 438 respectively, from the first three sources. Only 94 Ambakelle special seednuts were available for use in this trial due to the need of these for other purposes.

Seed beds were mulched with paddy straw and irrigated every 4th day during dry weather. Weekly sprouting records were maintained. Irrigation was discontinued with the onset of the Maha rains in November and the seedlings will not be irrigated hereafter. The nurseries were located at the highest elevation of the farm in order to create maximum moisture stress on the growing seedlings.

It is expected that drought tolerant seedlings will survive successive seasons of dry weather without irrigation. These will be considered genetically superior material, able to withstand the adverse conditions of the East coast, and will be utilised in the breeding programme.

R.R.A. Peries and H.P.P.H. Pathirana

Experiment 5.7 - (G3.8) Evaluation of the performance of F_1 progencies of tall (OP) and dwarf x tall on the East Coast (1981).

This trial was maintained satisfactorily. First flowering of *dwarf* x *tall* hybrids on this trial was observed in February at the age of 27 months from planting. Palm No. 234 flowered in February followed by palms nos. 297 and 338 in March. This represented 1.8% of this cultivar on the block. Although none of the other palms flowered during the year, these three have continued to produce inflorescences and now bear nuts at different stages of maturity.

Growth measurements were recorded in June but recording due in November/December had to be postponed due to disturbances in the area.

R.R.A. Peries and M.A.S. Fernando

Experiment 5.8 - (G4.5) Identification of drought tolerant palms (1982).

This block was irrigated every third day during the dry period at the rate of 10 gallons per palm. Ipil ipil was established in the centres of the coconut squares. Ammonium sulphate based young palm mixture was applied in split doses. This was supplemented with 10 kg of cow dung in an effort to increase moisture retaining capacity of the soil. Inspite of all efforts to reduce the number of casualties, several were reported during the year. Some vacancies were filled with material from the original selected parents.

R.R.A. Peries and M.H.L. Padmasiri

Experiment 5.9 - San Ramon crosses (1984).

The objective is to develop improved genotypes with increased yield and uniformly large nuts so that cost of production of endosperm products may be reduced.

The variety *San Ramon* is characterised by a tall, straight, stout trunk and a yield potential of 50-60 large round nuts per year with about 368 g (0.8 lb) copra per nut. Various intervarietal crosses using San Ramon have been attempted in the past; hybrids resulting from San Ramon crossed to *typica typica* or *typica bodiri* were not found to have any clear advantage over the parental types but the cross *San Ramon* x *nana pumila* was described as promising (Manthriratna, 1978).

At Bandirippuwa estate there are two blocks (field nos. 13 and 16) of San Ramon crosses established by this Division. Field no. 13 has San Ramon hybrids ie. *San Ramon* x *dwarf* and the reciprocals. These palms show considerable variation, probably due to lack of selection amongst the parents. These crosses will be repeated using selected parents as part of experiment no. 5.4.

Field no. 16 has some San Ramon selfed progeny and these show promise with some palms yielding as much as 35 to 40 kg of copra per annum. The best of these palms, details of which are given in Table 3, have been identified for use in a programme of pollination. These

Table 3. *San Ramon palms to be used as parents in the pollination programme.*

Palm no.	Parent palm no.	Months to flower	Nuts per annum	Copra per nut (kg)	Total copra per year (kg)
4	1870	60	39	0.482	18.798
16	1870	54	88	0.449	39.512
17	1870	52	28	0.458	12.824
18	1870	53	99	0.356	35.244
14	1733	59	53	0.360	19.080
15	1733	63	55	0.353	19.415

palms are the selfed progeny of parent palms planted near the Bandirippuwa estate nursery, which are in turn the open-pollinated progeny of San Ramon palms originally introduced from the Philippines (Dr. D.V. Liyanage, pers. comm.).

The selected San Ramon palms will be selfed, crossed with one another in different combinations and crossed with selected dwarf palms at the isolated seed garden, Ambakelle.

A programme of selfing was begun in July. A total of 49 inflorescences were bagged but all but two had to be abandoned due to damage of bags by rats, bats, squirrels and insects. Only 5 buttons remained on these two inflorescences three months after pollination. Control of damage to bags has not yet been achieved inspite of the use of insecticides, rodenticides, rat traps, and use of protective materials such as jute or wire mesh over the bags. Attempts to obtain successful pollinations continue.

M.R.T. Wickramaratne, M.H.L. Padmasiri and W.B.S. Fernando

Project 6 – Production of high quality seeds and seedlings.

Experiment 6.1 (G1.2) - Study of yield fluctuations in the Isolated Seed Garden, Ambakelle (1982).

Blockwise yield data were collected from five estates in the vicinity of Ambakelle viz. Nelunkuliya, Wilpotha, Amitha, Sittampalam and Uhampitiya. Analysis of this data is in progress.

M. R. T. Wickramaratne and V. K. R. S. Perera

Experiment 6.3 (G5.3) - Effect of slicing and position of laying in pre-nursery on sprouting of seed coconuts. (1982).

This trial was carried out to determine whether slicing of the nut on the ridge opposite the broadest surface and orientation of the nut significantly affected the time taken for sprouting.

Following a preliminary trial carried out in 1982 at Bandirippuwa estate, the trial was repeated using larger samples and at two locations, Bandirippuwa and Ambakelle, in October 1983. Plus palms seednuts from Moorock estate were used for this trial which had a randomized block design with four treatments, five replicates per treatment and 100 nuts per replicate.

Treatments were as follows:

T_1 Broadest side lowermost, ridge opposite not sliced.

T_2 Broadest side lowermost, ridge opposite sliced.

T_3 Broadest side uppermost, ridge opposite not sliced.

T_4 Broadest side uppermost, ridge opposite sliced.

Seednuts were laid in a pre-nursery and mulched with unwoven cadjan. Irrigation was provided every third day whenever there was a dry spell of six or more days. Sprouting was recorded at weekly intervals from the date of laying and sprouted nuts were transferred weekly from pre-nursery to nursery bed. A sample of 200 nuts at each location comprising 100 early germinators and 100 late germinators were carefully husked after sprouting in order to determine the position of the soft eye in relation to the broadest surface of the nut.

Sprouting was first observed in the sixth and seventh weeks from laying and continued upto 23 and 26 weeks at Bandirippuwa and Ambakelle respectively. Eighty percent sprouting was generally reached by the 17th to 19th week at Bandirippuwa and the 19th to 20th week at Ambakelle.

Results were analysed at both 16 and 20 weeks and showed a clear difference between locations with percentage sprouted being significantly higher at Bandirippuwa in both instances. At 20 weeks from laying mean sprouting was 88.35% at Bandirippuwa and 83.95% at Ambakelle.

There was hardly any difference in numbers of rainy days or lengths of dry periods at the two different locations but since regular irrigation was provided this is not expected to cause differences in sprouting. Total rainfall was markedly higher at Bandirippuwa particularly during the first four months from laying during which period most of the sprouting took place. It is possible that the changes in the environmental conditions of humidity and temperature ensuing from this made conditions at Bandirippuwa more 'conducive' for faster sprouting.

The evidence did not indicate any distinct advantage in slicing of nuts prior to laying. Although a slight advantage was noted during the early stages at Bandirippuwa, this disappeared with time. Slicing had no effect on sprouting of seednuts at Ambakelle.

Orientation of the nut did not influence the sprouting significantly at either location. As long as the nut was laid horizontally, the position of the broadest side in relation to the soil surface did not significantly affect sprouting of the nut.

Scoring the nuts for position of soft eye in relation to the broader surface of the nut showed that out of a sample of 400 nuts, 143 had the soft eye just beneath the ridge opposite the broader surface of the nut while on 257 occasions the soft eye was nearer the broad side. This ratio is not significantly different from a 1 : 2 ratio. There was no significant difference between early and late germinators and/or between the two different locations. Similar proportions were also obtained previously (cf. Annual Report of 1982 and 1983).

The position of the soft eye is of interest as it is believed that this affects sprouting. In the Philippines it is believed that the functional eye through which the sprout emerges lies just below the ridge and that trimming and positioning with the flat surface lowermost and ridge pointing upward facilitates sprouting and normal development of seedlings (The Philippines recommends for coconut 1975). In India horizontal planting is recommended but with the widest of the three surfaces uppermost; it is believed that this helps as the soft or germinating eye lies below this surface (Menon & Pandalai, 1958).

There are three ridges on the coconut fruit, one of which is opposite the broadest side and the other two each opposite a flat surface. The nut is so positioned within the mesocarp that one eye lies just below this ridge opposite the broadest side. The other two lie beneath the other two ridges and are hence closer to the broadest surface. It is possible that any one of these three eyes may develop into the soft eye leaving the other two to abort. There is, therefore, a one in three chance that the soft eye lies close to the ridge and a two in three chance that it lies nearer the broad side. This explains the 1 : 2 ratio observed.

There are two possibilities regarding the best position for sprouting. Laying the nut with the soft eye towards the dorsal side may help the sprout to emerge faster. On the other hand, laying the nut with the soft eye closer to the lower surface may ensure that the soft eye is in contact with the liquid endosperm for a longer period and this may enhance germination.

Since it is not known whether the soft eye lies closer to the broadest surface or the ridge opposite in any particular nut, it is not possible to position it such that early sprouting is enhanced.

M. R. T. Wickramaratne, V. K. R. S. Karunaratne and M. H. L. Padmasiri

Experimen 6.5 (G5.5) - Study of variation in seedling characters of different coconut types/ cultivars (1982).

In order to lay all three types of seedlings (*tall, dwarf* x *tall* and pure *dwarf*) simultaneously in the nursery a programme of pollinations of dwarf palms was begun. Nuts will be harvested and laid in 1985.

V. K. R. S. Perera and M. H. L. Padmasiri

Experiment 6.6 (G5.6) - Effect of maturity of D x T nuts on sprouting (1982).

A preliminary trial indicated that while nuts harvested at 13 or 14 months sprouted early there were associated disadvantages such as sprouting on the heap or even germinating while still attached to the mother palm (vivipary). The number of treatments was therefore reduced and only bunches of age 10,11 and 12 months were tested for effect of maturity on sprouting. The experiment is in progress.

V. K. R. S. Perera and M. H. L. Padmasiri

Experiment 6.7 (G7.1) - Evaluation of criteria used in plus palm selection (1983).

This trial is located on the following five estates: Moorock estate, Mawathagama; St. Annes estate, Mampuri; Siringapatha estate, Badalgama; Marandawila Farm, Bingiriya and the Isolated Seed Garden, Ambakelle. Thirty palms per estate were chosen, from amongst the selected high yielding palms (plus palms), ensuring that these palms were not in specially favourable conditions. Collections of data regarding yield components is in progress.

V. K. R. S. Perera and M. A. S. Fernando

Miscellaneous experiments –

Experiment G3.1 - Comparison of performance of yield of *typica x pumila* and *typica* (OP) F_1 progenies at PRS, field no. 3 (1962)

Experiment G3.2 - Study of growth and relative yields of F_1 progenies of *typica x pumila, typica x typica* (prepotent) and *typica* (OP) at PRS, field no. 5 (1962).

Experiment G3.3 - Isolation of male transmitters and comparison of efficiency of *pumila x typica* and *typica x typica* at PRS, field no. 6 (1963).

Experiment G3.4 - Evaluation of the performance of *dwarf x San Ramon* and *San Ramon x dwarf* hybrids at B/E, field no. 13 (1968).

Experiment G3.5 - Evaluation of the performance of *tall x dwarf* and *dwarf x tall* hybrids at B/E, field no. 14 (1969).

Experiment G3.6 - Evaluation of the performance of *typica x nana pumila, typica x nana regia* and reciprocals at PRS, field no. 10 (1972).

Experiment G3.7 - Comparison of the performance of different crosses using exotic parents: *San Ramon* selfed, *Tall* (B/E) x *Brazilian green dwarf, Tall* (R/E) x *Ghana yellow dwarf* and intravarietal *nana* crosses at B/E, field no. 16 (1973).

The above trials are all long term trials for which recording of weights of husked and split nuts have been started in late 1983 or early 1984. Yield recording continues and a preliminary analysis of data will be carried out when at least two years data are available.

Experiment G3.8 (G3.9) - Minneriya variety trial for the performance of *tall x tall, dwarf x tall* and *Moorock tall* in the dry zone (1983).

The plantation was satisfactorily maintained throughout the year. Water logging due to heavy rains caused several casualties. About 90 seedings from all three varieties were supplied to fill the vacancies.

R. R. A. Peries

Experiment G4. 1 - Isolation of male transmitters at PRS, field no. 1 (1961).

Experiment G4.2 - Effect of inbreeding in coconut palms at PRS, field no. 2 (1961).

Experiment G4.3 - Comparison of yield of F_1 progenies of *typica x typica* (prepotent) and *typica* (OP) at PRS, field no. 4 (1962).

Experiment G4.4 - Testing of general combining ability using yield data from 8 x 8 diallel crosses including reciprocals and selfs at PRS, field no. 8 (1964).

These experiments are in progress.

THE ISOLATED SEED GARDEN, AMBAKELLE.

Extents and details of planting are given in Table 4 and classification of palms is shown in Table 5. There are a total of 6867 tall, 2899 dwarf green and 1756 dwarf yellow palms in bearing.

Table 4. *Extent and details of planting*

Field no.	*Extent* ac	ha	*Planting material*	*Planting* distance*	*Planting system*	*Planting date*
1	4.5	1.82	Tall	26 x 26	Square	Dec. 1955
2	4	1.62	Tall	26 x 18	Hedge	Nov. 1956
3	4	1.62	Tall	26 x 22	Rectangular	Nov. 1956
4	34	13.80	Tall	26 x 26	Triangular	Nov. 1956/57
5	7	2.84	(1) Dwarf	22 x 18	Triangular	Nov. 1959
			(2) Tall and dwarf	24 x 24 22 x 18	Square) Triangular)	Dec. 1983
6	20	8.10	Tall	25 x 25	Triangular	Nov. 1960
7	20	8.10	Tall	24 x 18	Hedge	Nov. 1961
8 A	10	4.05	Tall	25 x 25	Square	June 1962
8 B	5	2.03	Tall	25 x 25	Square	Nov. 1962
8 C	5	2.03	Tall	32 x 12	Hedge	May 1963
9	25	10.13	Tall and dwarf	Between rows 26, within rows tall 26, dwarf 22.		Oct. 1966
10 A	25	10.13	Tall and dwarf	22 x 22	Square	Nov. 1972
10 B	25	10.13	Tall and dwarf	22 x 22	Square	May 1973
11 A	30	12.15	Tall and dwarf	22 x 22	Square	Oct. 1973
11 B	30	12.15	Tall and dwarf	22 x 22	Square	Nov. 1973
12	22	8.91	(1) Tall and dwarf	22 x 22	Square	May 1974
			(2) Tall	25 x 25	Triangular	Lined in 1984
13	37	14.99	(1) Tall and dwarf	22 x 22	Square	Oct. 1974
			(2) Tall	25 x 25	Triangular	June 1984
14	37	14.99	Tall and dwarf	22 x 22	Square	Nov. 1974
Total	344.5	139.59				

* Planting distance is given in Feet.

(1) First plantation. (2) Second plantation.

Table 5. *Classification of palms.*

Field no.	Tall								Dwarf green								Dwarf yellow								Total for field
	B	PB	YP	S	D	NH	V	Total	B	PB	YP	S	D	NH	V	Total	B	PB	YP	S	D	NH	V	Total	
1	239	–	52	10	5	–	24	330	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	330
2	252	–	–	42	–	–	122	416	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	416
3	269	–	–	34	–	–	38	341	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	341
4	1897	–	19	171	–	–	475	2562	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2562
5 (1)	–	–	–	–	–	–	–	–	136	11	–	–	–	–	603	750	–	–	–	–	–	–	–	–	750
5 (2)	–	–	–	396	–	–	23	419	–	–	–	227	–	–	23	250	–	–	–	–	–	–	–	–	669
6	876	–	–	–	6	–	497	1379	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1379
7	693	–	–	–	–	–	724	1417	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1416
8-A 8-B 8-C	894	–	–	–	5	–	656	1555	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1555
9	637	–	–	–	–	–	174	811	300	14	5	98	1	–	526	944	–	–	–	–	–	–	–	–	1755
10-A	190	1	2	–	–	–	11	204	126	–	–	–	–	–	28	154	852	24	88	31	–	–	518	1513	1871
10-B	132	3	–	–	–	–	24	159	346	2	27	7	–	–	368	750	318	7	28	15	–	–	125	493	1402
11-A	284	23	37	1	–	–	36	381	533	11	2	6	–	–	479	1031	196	32	20	16	–	–	802	1066	2478
11-B	245	15	13	–	–	–	29	302	271	2	–	–	–	–	428	701	390	8	2	4	–	–	552	956	1959
12 13	Being replanted																								
14	259	45	51	–	–	–	107	462	–	3	–	–	–	2	1454	2646	–	–	–	–	–	–	–		3108
Total	6867	87	174	654	16	–	2940	10738	2899	43	34	338	1	2	3909	7226	1756	71	138	66	–	–	1997	4028	21992

B, bearing palms; PB, partially bearing; YP, young palms; S, seedlings; D, duds; NH, natural hybrids; V, vacancies.
(1) and (2), first and second plantations on field no. 5.
* Includes one twin palm.
Figures for fields 12 and 13 are not included as they are in the process of being planted.

Rainfall - Table 6 gives rainfall intensity and distribution for the last 8 years. Total rainfall for the year was 2389.1 mm. This is 1180.2 mm more than that of the preceding year and 867.9 mm more than the average for the last eight years. Both rainfall intensity and the total number of rainy days were higher than they have been during the last eight years. Rainfall distribution was exceptionally good with no long dry spell at all. In April there was an unprecedented rainfall of 821.4 mm with as much as 385.5 mm recorded within a period of 8 hours on the 22nd. This caused the tank bund and its spill to be breached and the field roads were eroded as a result.

Much of the coconut area was flooded repeatedly during the early part of the year. The heavy rains caused a set back to several field operations. A considerable increase in crops of 1985 is expected due to the favourable weather conditions which prevailed in 1984.

Crops - Total crop figures from 1977 - 1984 are given in Table 7. The total crop of 1984, amounting to 586331 nuts is 323607 less than in 1983 and 27163 less than the average for the last eight years. The decrease in crop from last year amounting to 35.6% is attributable in part to the extended dry spell in early 1983. This was aggravated by loss of palms due to lightning and uprooting of palms due to replanting.

Separate crop figures for the tall and dwarf palms are given in Table 8. Both varieties show a decrease in crop; whilethe tall crop improved over that of 1983 towards the end of the year, the dwarf crops showed an alarming reduction, the fourth and fifth crops of the year showing reductions of 57.2 and 85.7% respectively. This is a clear indication of the different responses of the two varieties to fluctuating weather conditions and merits further study.

Seednut Production - Total seed production from the isolated seed garden during the year amounted to 437193 nuts comprising 338625 *Ambakelle tall* (CRIC 60 or T x T), 3789 Ambakelle special, 73287 *dwarf green* x *tall (CRIC 65 hybrid) and 21492 kelle special, 73287 dwarf green x tall*

Seednut Production - Total seed production from the isolated seed garden during the year amounted to 437193 nuts comprising 338625 *Ambakelle tall* (CRIC 60 or T x T), 3789 Ambakelle special, 73287 *dwarf green* x *tall* (CRIC 65 hybrid) and 21492 *dwarf yellow* x *tall* (CRIC 65 hybrid) for which selection percentages were 82.0, 87.1, 84.8 and 82.0 respectively. Details of seednut production over the years are given in Table 9 and cropwise selection figures for 1984 are given in Table 15 (under section 4).

Typica seednuts - In addition to nuts harvested from tall palms on fields 1 - 4 and 6 - 9, those from the tall palms on the younger dwarf plantations, fields 10 - 14, were also used as seednuts for the first time beginning with the second crop of 1984. Percent seednut selection for CRIC 60 was maintained at over 78% at all six picks of the year (Table 15).

Nana x typica seednuts - As the supply was greater than demand, fallen nuts were not used for seednut selection except for the sixth crop. Experimentation regarding the best stage for harvesting CRIC 65 nuts caused lowered selection percentages in some instances.

Emasculaltion of dwarf palms - A total of 76381 inflorescences were emasculated over the year, details of which are given in Table 10. Due to the shortage of staff and the surplus of CRIC 65 hybrids, inflorescences on field nos.12 and 13 were cut away instead of emasculating them.

Controlled pollinations - The programme of pollen collection and pollination, begun last year, was in full swing by 1984. Details are given in section 5 entitled "Pollen and pollination" and in section 2.4, experiment 5.4.

Crop disposal - Crop disposal figures are given in Table 11.

Table 6. *Rainfall intensity and distribution 1977 - 1984*

Month	1977		1978		1979		1980		1981		1982		1983		1984		Average for 8 years 1977 - 1984	
	Intensity (mm)	Rainy days	Intensity (mm)	Rainy days	Intensity (mm)	Rainy days	Intensity (mm)	Rainy days	Intensity (mm)	Rainy days	Intensity (mm)	Rainy days	Intensity (mm)	Rainy days	Intensity (mm)	Rainy days	Intensity (mm)	Rainy days
January	–	–	–	–	13.1	2	0.5	–	36.9	3	–	–	–	–	96.9	11	18.42	2.12
February	27.4	2	–	–	60.0	6	–	–	11.5	2	–	–	2.1	1	228.9	19	41.24	3.75
March	168.7	8	23.3	5	17.6	5	23.7	1	93.5	6	176.3	4	1.6	1	279.7	11	98.04	5.12
April	110.2	5	158.7	7	59.8	7	164.5	16	48.4	10	61.7	8	52.8	4	821.4	17	184.70	9.25
May	451.1	20	405.1	15	11.4	4	87.8	7	147.8	13	281.8	13	248.8	13	155.5	6	223.70	11.40
June	21.6	5	11.1	2	34.8	5	147.9	9	143.9	15	110.7	17	73.4	14	29.1	11	72.26	9.75
July	25.0	4	16.4	3	19.4	3	5.8	2	72.5	9	32.1	9	26.4	7	117.0	10	39.32	5.87
August	19.7	4	10.1	3	10.6	3	10.0	4	54.3	5	91.6	4	78.0	9	3.8	2	34.76	4.25
September	31.7	3	32.9	6	197.8	13	106.9	8	68.4	14	35.6	4	89.4	17	164.7	9	90.92	9.25
October	759.9	22	521.6	16	160.6	14	272.1	13	280.3	15	199.9	20	105.7	10	227.3	14	315.92	15.5
November	217.	12	582.9	12	356.6	21	251.0	16	295.9	19	152.7	18	199.3	13	210.6	18	287.02	16.12
December	34.0	2	97.6	12	172.1	9	82.7	15	54.3	7	93.4	13	331.4	16	53.6	6	114.88	10.0
	1896.50	87	1859.7	81	1113.8	92	1152.9	92	1312.7	118	1235.8	110	1208.9	105	2389.1	134	1521.18	102.38

– Indicates zero rainfall

Table 7. *Total crop figures 1977 - 1984.*

Year / *Pick no.*	*1977*	*1978*	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*8 year average*
1	46436	88395	89394	26009	86152	116469	107991	65510	78294.5
2	65806	130828	135791	26357	128187	195823	228416	51318	120315.75
3	42317	126451	157149	22149	167807	174913	166714	111497	121124.62
4	34164	160375	97407	23707	95029	204315	151116	122462	111071.875
5	36851	174995	44394	23183	103628	148255	162268	129392	102870.75
6	49171	113094	37123	44214	94127	101217	93433	106152	79816.38
Total	274745	794138	561258	165619	674930	940992	909938	586331	613493.87
No. of bearing palms	8166	10381	9854	11544	12036	11946	13034	12873	11229.25
Average no. of nuts per palm	34	76	57	14	56	78	70	46	54

Table 8. *Total numbers of nuts harvested from tall and dwarf palms in 1983 and 1984.*

	Tall		*Dwarf*	
Pick	*1983*	*1984*	*1983*	*1984*
1	73 134	27 976	34 857	37 534
2	181 160	24 397	47 256	26 921
3	147 890	82 184	18 824	29 313
4	129 529	113 228	21 587	9 234
5	89 876	119 069	72 392	10 323
6	52 439	69 528	40 994	36 624
Total	674 028	436 382	235 910	149 949†
No. of palms in bearing	7 353	7 260	5 754*	5 613*
Nuts/palm	91.7	60.1	41.0	26.7

† Includes 42 nuts harvested from natural hybrid palms.

* Includes 73 and 2 natural hybrid palms in 1983 and 1984 respectively.

Table 9. *Seednut production over the years 1976 - 1984.*

Cultivars	*Typica**		*CRIC 65* *Nana pumila x typica*		*Nana eburnea x typica*		*Total (Nana x typica)*		*Grand Total Total improved cultivars*	
Year	*Harvested+ (Heaped)*	*Selected*	*Heaped*	*Selected*	*Heaped*	*Selected*	*Heaped*	*Selected*	*Harvested (Heaped)*	*Selected*
1976	662 366	206 447	55 836	46 492	–	–	55 836	46 492	718 202	252 939
1977	239 242	82 807	35 503	25 864	–	–	35 503	25 864	274 745	108 671
1978	676 161	266 195	108 587	96 681	9 390	8 326	117 977	105 507	794 138	371 702
1979	502 724	162 831	42 508	33 913	16 026	13 701	58 534	47 614	561 258	210 445
1980	148 351	55 512	14 942	10 961	2 326	1 601	17 268	12 562	165 619	68 074
1981	580 363	166 720	72 415	61 324	21 792	18 335	94 207	79 659	674 570	246 379
1982	684 778 (641 143)	344 876	168 025	152 900	64 987	60 530	233 012	213 430	917 790	558 306
1983	674 028 (612 886)	438 919	124 003	103 794	41 984	36 829	165 987	140 623	778 873	579 542
1984	436 382 (417 129)	342 414	86 388	73 287	26 197	21 492	112 635	94 779	529 764	437 193

* During the period 1976 - 1981 Typica seednuts were issued as two grades, *tall* x *tall* (CRIC 60) and ordinary tall. In 1982 all seednuts from tall palms on fields 1 - 4 and 6 - 9 were issued as CRIC 60. From 1983 this procedure continued but seednuts from special palms on fields 1 and 2 were categorised as *Ambakelle special*. In 1984 seednuts from tall palms on fields 10 to 14 were also issued as CRIC 60, beginning with the second pick.

\+ Harvested - total crop; Heaped - nuts heaped for selection. Figures in parentheses under *typica* are heaped nuts for 1982, 1983 and 1984.

In 1984, due to a surplus of CRIC 65 hybrids, fallen nuts of *nana* x *typica* were not used for seednut selection except for the sixth crop.

Table 10. *Emasculation of dwarf palms for the production of nana x typica (CRIC 65) hybrid seednuts.*

Field no.	*No. of palms emasculated*		*No. of inflorescences emasculated*		*No. of buttons at emasculation*	
	a	*b*	*a*	*b*	*a*	*b*
5	147	–	1 982	–	62 351	–
9	315	–	3 986	–	156 160	–
10 A	128	865	1 843	14 296	68 582	414 914
10 B	350	325	5 585	5 661	371 815	238 896
11 A	545	248	8 570	3 291	353 802	95 082
11 B	274	396	4 048	6 445	153 058	180 185
12*	(362)	(26)	(2 676)	(209)	nil	–
13	622 (633)*	– –	2 380 (7 701)*	– –	42 474	–
14	1 212	–	18 294	–	551 086	–
Total	3 593	1 834	46 688	29 693	1 759 328	929 077

a, b, Data for dwarf green and dwarf yellow palms, respectively.

* Due to the large surplus of hybrid nuts, inflorescences on field no. 12 were cut away in place of emasculation. The same procedure was carried out on field no. 13 from April, the numbers of palms and inflorescences involved being given in parenthesis.

A total of 351 and 2186 inflorescences which opened naturally while still immature were also cut away on green and yellow dwarf palms respectively on different fields.

Table 11. *Crop disposal as at 31st December, 1984.*

Method of disposal	*Number of nuts of the different cultivars*			*Total*	*Percent of total production*
	Tall x Tall	*DG x T*	*DY x T*		
1. Delivered as seednuts	295 825	44 732	14 033	354 588	60.48
2. Husked and split nuts.*	16 387	12 487	12 865	41 739	7.12
3. Taken for research purposes:					
(i) By G.P.B. Division	96	3 645	1 144	4 885	0.84
(ii) By C.P.D. Division	40	–	–	40	
4. Nut allowance to staff	16 009	–	2 100	18 109	3.09
5. Sold on contract (crops 1 to 4)	12 700	–	–	12 700	2.17
6. Cured into copra (excluding item 2 of this table)	1 540	–	–	1 540	0.26
7. Rejections (Not suitable for curing)	21 158	11 158	5 143	37 459	6.39
8. Missing (due to floods)	–	–	28	28	0.005
9. To be disposed **	72 629	33 671	8 943	115 243	19.65
Total	436 382	105 693	44 256	586 331	100.00

* From fields 1, 2, 3 and 4 (tall) and fields 5, 9, 10A and 10B (dwarf), used for recording weights of nuts.

** Includes seednuts awaiting delivery, nuts to be sold including fallen CRIC 65 nuts and a reservation for nut allowance for the first two weeks of 1985.

Field operations and maintenance

(i) **Manuring** - In an effort to increase the organic matter content and the nutrient and moisture holding capacities of the soil, goat dung supplemented with TSP and muriate of potash was applied to all tall palms on fields 1-4, 6-9 and 974 palms on field 10A. All tall palms were also treated with dolomite at the rate of 1.5 kg per palm.

The inorganic fertilizer mixture used at the seed garden was changed from CU1 to CU3 in view of the soil type. All palms on fields 10B, 11A, 11B, 12, 14 and part of 10A and tall palms on field no. 13 were manured with CU3 mixture at the recommended dosage.

Young palms were given young palm mixture (YPM) in two equal split doses. Due to the excessive moisture in fields 3 and 4 caused by the heavy rains it was not possible to apply YPM to these fields.

(ii) **Husk burying** - Difficulty in procuring coconut husks caused problems regarding the husk burying programme. Priority in use of husks was given to the planting programme so that after the use of husks in planting holes and for mulching seedlings it was possible to complete only 78 huskpits in field no. 3 during the year.

(iii) **Drains** - Contour drains opened in 1983 were desilted and their bunds maintained. 384 fathoms of drainage drains (3' x 1½') were opened on field no. 5 to drain off stagnant water in low lying areas. These drains were connected to the natural stream leading to Tank A.

Field no. 12 which was low lying and poorly drained and had a large number of vacancies was identified for replanting. About 12 acres of the lowest lying area was raised by a system of drainage drains similar to the herring bone drainage system. One hundred and forty fathoms of leader drains (3' x 2') and 783.5 fathoms of sub-drains (3' x 1½') were opened on this field.

(iv) **Weed control** - The heavy rains and the lack of a long dry spell aggravated the recurrent problem of weeds.

(v) **Cover crops** - 10 kg of *Calopogonium mucunoides* and 10 kg of *Pueraria phaseoloides* seeds purchased during the year were sown in parts of fields 5, 11A, 12, 13 and 14 where growth of illuk was most dense. Sunhemp was sown on about 2 acres of field no. 13.

(vi) **Pests and diseases** - Red weevil attack was minimized by frequent inspections followed by the continued application of tar on cracked barks and damaged tissues of dwarf palms. Ten labourers were employed daily in beetle catching and inspection for other pests. Twelve wasp colonies in the crowns of palms were destroyed by burning.

Thirty two palms showing leaf blight symptoms were treated with muriate of potash at the rate of 300 gm/palm. Palms affected with leaf scorch were brought to the notice of the Crop Protection Division officers who have made a collection of insects from these palms for further investigation.

(vii) Uprooting of palms - A total of 542 palms were uprooted, their distribution being as follows:

Field no.	1	3	4	6	7	8	9	10A	10B	11A	11B	12	13	14
No. of palms	20	1	14	31	33	28	11	45	16	14	6	280	44	2

The uprooting of large numbers of palms on fields 12 and 13 was due to the replanting of these fields in a different design. Uprooting on other fields was mainly of palms damaged by lightning (48 palms on fields 1, 4, 6, 8 and 9) and dud or unproductive palms, many of which showed signs of tapering.

(viii) Filling of vacancies - Infilling of vacancies on fields 1 to 3 had to be postponed due to water-logging of these fields at the time planting was planned. Casualties in field no. 5 were replaced.

(ix) Replanting - Both fields 12 and 13 were earmarked for replanting with tall palms only, in view of the lack of demand for CRIC 65 and the surplus of this cultivar already available. The chosen planting distance and system was 25' x 25' triangular.

In field no. 13 it was planned to plant a block of 1000 in a fully randomized planting design for comparison of performance of genotypes with performance of similar genotypes planted at the Makandura Seed Garden. For this purpose, an equal number of progeny from the same seed palms (Ambakelle special) were used for planting in both seed gardens. Eight hundred and fifty nine of these 1000 seedlings were planted during the year. The balance could not be completed due to nonavailability of the specific seedlings. One thousand four hundred and thirty five (1435) Ambakelle special seedlings were planted in a mixed design in the rest of the field. Some planting holes in the low lying areas could not be planted due to water logging.

In field no. 12 land preparation and opening of planting holes were completed. Ambakelle tall (CRIC 60 or T x T) will be used for this plantation due to the nonavailability of Ambakelle special in sufficient quantities.

(x) Fences - One hundred and sixty three fathoms of new fencing were erected on the Pallama boundary. Other fences were maintained in good order.

(xi) Roads, paths and buildings - These were maintained satisfactorily.

(xii) Electricity and water supply - There has been no electricity supply for the last two years during which period the generator has been under repair. Water was pumped into overhead tanks for domestic use of resident staff.

(xiii) Vehicles, machinery and tools - Vehicles and equipment have been satisfactorily maintained. A new bowser of capacity 800 gallons was purchased for use in irrigating the new plantations and nurseries. A new gun was purchased

Tanks and Irrigation project - Grave damage was caused by the heavy rains. The tank bund and spill of tank A were breached and subsequently repaired. The bank of tank B was badly eroded and repaired. However one benefit of the floods caused by the heavy rains and breached tanks was that the Salvinia which was a problem was got rid of naturally.

The riser pipes of the irrigation network were all given identification numbers and the surrounding area kept clean weeded.

Forest plants were planted in barren areas beside the tanks to reduce soil erosion. Varieties used include *Terminalia glabra* (Kumbuk), *Chloroxylon swietenia* (Satin), *Pericopsis mooniana* (Nedun), *Filicium decipiens* (Pehimbiya), *Bassia longifolia* (Mee), *Azadirachta indica* (Margosa) and *Swietenia mahagoni* (Mahogany). A hedge of *Leucaena leucocephala* (ipil-ipil) was established on the banks.

Cattle - The herd of 30 was increased to 37 by the end of the year. All animals except the small calves were branded. A total of 11 were culled of which 3 were sold and 8 remain to be disposed of. The herd consists of 13 cows, 3 bulls, 4 heifers, 12 bull calves and 5 heifer calves amounting to a total of 37 at present.

Jungle barrier - Two watchers were employed daily on the jungle barrier. Due to the prompt action taken last year against those arrested for illicit felling of trees, this activity has now been reduced considerably. Jeep tracks and fire breaks were well maintained.

Research Nursery - The nursery at the isolated seed garden, Ambakelle is no longer a commercial nursery but is used for research purposes and for raising seedlings for planting at Ambakelle and for other field trials. A detailed report is given in section 6 entitled Research Nursery.

SEED PRODUCTION

W.M.J. Karunaratne

Seednut supply - There was a drastic reduction in yields this year consequent to the severe and prolonged drought of 1983. The shortfall in Maha 1984 supplies caused by the drought was aggravated by the rescheduling of seednut supplies necessitated by the lack of irrigation facilities in many of the Coconut Cultivation Board (CCB) nurseries. As a result it was necessary to supplement the plus palm nuts with blocknuts so that although blocknuts supply was given up in 1983, it was resumed in the first half of 1984 with about 70% of the total supplied for Maha 1984 being block nuts.

When supplies for Yala 1985 were started, it was decided that block nuts would no longer be supplied by us. The CCB requirement for Yala was much lower than recommended by the Consultant in Breeding and was supplied without difficulty over the period May to September.

Maha 1985 supplies were begun in October. The initial CCB requirement of 1310000 was subsequently increased to over 2 million which was well over the recommended amount for Maha planting. It was agreed that the CRI would supply upto 1500000, which was about the quantity recommended, from plus palms and Ambakelle seednuts. Any additional material would be procured by CCB from blocknuts.

Details of seednut supply for these three seasons are given in Table 12. A total of 1657724 plus palms seednuts, 1127098 blocknuts, 275264 CRIC 60 (T x T) and 85112 CRIC 65 (D x T) were supplied during the year.

Plus Palms - The selection of an additional 10 to 12 thousand plus palms scheduled for this year suffered a setback due to the increased activity consequent to resumption of blocknut supply in the early part of the year and the lack of staff and transport facilities later on. Only 4636 plus palms on four estates were selected during the year. Seventy two palms out of the 41492 available in 1983 were lost through drought damage, lightning and removal on account of power supply, widening of roads etc. bringing the total number of plus palms at the end of 1984 to 46056 on 24 estates within the Coconut triangle. Their distribution is given in Table 13.

Seednut selection - All seednuts produced from all crops of the year were made available on only 17 of the 24 estates. Certain estates utilised some of the selected seednuts for their own planting programmes while in others crops were missed due to delay in informing picking dates, inclement weather causing damage to roads etc. and selection of plus palms towards the end of the year. Details of production and seednut selection for the above mentioned 17 estates are given in Table 14. The islandwide reduction in yield is reflected in the mean number of nuts per palm on several of these estates also. Those with exceptionally low yields such as Kiniyama and Andigedera will be investigated further. However, many of these estates have been producing over 60 nuts per palm inspite of the low crops elsewhere.

Selection percentage was generally maintained at around 80% or more. On occasion only 55 to 75 percent were selected due to a variety of reasons such as presence of fallen nuts in the heap due to improper collection, reduced nut size probably caused by drought conditions of the preceding year etc.

Mean percentage selection at ISG, Ambakelle was 82.08% for tall and 84.1% dwarf x tall hybrids. Details are given in Table 15.

Miscellaneous - During the period July to November 1984, seed production was handled by Mr. R.R.A. Peries, R/A, assisted by Mr. H.P.P.H. Pathirana, T/A.

The Coordinating Committee for the Improvement of Coconut Seedlings did not meet during the year. However, difficulties regarding seednut production were satisfactorily resolved following meetings of the Seed Production Officer and the Head, Genetics & Plant Breeding with staff of the Coconut Cultivation Board such as Deputy General Manager (Finance), AGM (Inputs) and AGM (Technical). On 21st December a special meeting was held at the Coconut Cultivation Board Office in Colombo for discussion of increasing seednut requirements of CCB and other activities regarding seednut production. This was attended by the Director (Planning) of the Ministry of Coconut Industries, the Chairman, and other concerned officials of the CCB and the Chairman, Coconut Research Board and the Head, Genetics & Plant Breeding of CRI. It was decided to expedite the plus palms selection programme and the need for increasing the price paid for seednuts was also agreed upon. Further it was decided that during 1984/85 priority in seednut supply by CRI would be given to nurseries in the Coconut triangle and Coconut Development Project areas, while areas outside this would be given blocknuts procured by the CCB.

R.R.A. Peries, P. Kariyawasam and H.P.P.H. Pathirana

Table 12. *Seednuts supplied for each season.*

Year & Quarter	*Planting Season*	*CCB Nurseries*					*CRB Nurseries*					*Others**					*Grand total*
		PP	*BN*	*T x T*	*D x T*	*Total*	*PP*	*BN*	*T x T*	*D x T*	*Total*	*PP*	*BN*	*T x T*	*D x T*	*Total*	
1984/1	Maha 84	190 940	316 545	9 000	47 910	564 395	-	1 250	9 075	-	10 325	-	-	-	-	-	574 720
1984/2	Maha 84	73 490	735 403	-	5 533	814 426	-	22 586	7 602	2 415	32 603	-	29 814	-	-	29 814	876 843
TOTAL MAHA 84		361 830	1 051 948	29 550	53 443	1 496 771	-	23 836	16 677	2 415	42 928	-	29 814	-	-	29 814	1 569 513
1984/2	Yala 85	517 525	-	42 160	-	359 685	-	-	11 025	-	11 025	-	-	-	-	-	370 710
1984/3	Yala 85	553 191	-	71 575	11 054	635 820	4 149	1 500	14 000	6 000	25 649	-	20 000	3 000	-	23 000	684 469
TOTAL YALA 85		870 716	-	113 735	11 054	995 505	4 149	1 500	25 025	6 000	36 674	-	20 000	3 000	-	23 000	1 055 179
1984/4	Maha 85	518 429	-	104 827	12 200	635 456	-	-	-	-	-	-	-	3 000	-	3 000	638 456
Total supplied during 1984		1 653 575	1 051 948	227 562	76 697	3 009 782	4 149	25 336	41 702	8 415	79 602	-	49 814	6 000	-	55 814	3 145 198

* For export and to Government Farm, Weerapana.

PP, plus palms seednuts; BN, block nuts; T x T, CRIC 60; D x T, CRIC 65.

Table 13. *Distribution of plus palms on estates.*

Serial No.	*District*	*Estate*	*Ownership*	*No. of plus palms*
1	Kurunegla	Moorock estate - Mawathagama	Private	2693
2	do	Daisy Valley estate - Mawathagama	J.E.D.B.	3662
3	do	Dematagolle estate - Melsiripura	Private	572
4	do	Diyature estate - Melsiripura	Private	466
5	do	Walpolayaye estate - Melsiripura	Private	1025
6	do	Walpolayaye estate - Melsiripura	N.L.D.B.	2266
7	do	Wagolle estate - Melsiripura	N.L.D.B.	1373
8	do	Pamburukaduwe estate - Melsiripura	N.L.D.B.	377
9	do	Moralanda estate - Bingiriya	N.L.D.B.	567
10	do	Marandawila estate - Bingiriya	N.L.D.B.	7419
11	do	Andigedara estate - Bingiriya	J.E.D.B.	2126
12	do	Kiniyama estate - Bingiriya	J.E.D.B.	3487
13	Puttalam	Walahapitiya estate - Nattandiya	Private	1199
14	do	Letchemy estate - Nattandiya	Private	2439
15	do	Keenakelle estate - Mudukatuwa	Private	765
16	do	Bowatta estate - Mudukatuwa	Private	749
17	do	Horakelle estate - Kudawewa	N.L.D.B.	2707
18	do	Nelunkuliya estate - Kumarakattuwa	J.E.D.B.	569
19	do	Fruit Garden estate - Angunawila	Private	571
20	do	Midland estate - Baththulu Oya	Private	1413
21	do	Dispensary estate - Mundel	Private	823
22	do	St. Annes estate - Mampuri	Private	3287
23	do	Wilpotha Mukalana - Katupotha	Private	551
24	Gampaha	Siringapatha estate - Badalgama	N.L.D.P.	4950
	Total	24 estates		46056

Table 14. *Production and seednut selection from 17 estates which supplied seednuts throughout the year.*

Estate	*Nuts harvested from plus palms*	*Mean nuts per palm*	*Seednuts selected*	*Percent selected*	*Range of % selected*
1. Moorock	128 309	47	111 215	86.6	76 - 83
2. Diyature	21 268	45	15 850	74.5	78 - 89
3. Walpolayaya	44 436	43	35 825	80.0	74 - 89
4. Wagolla	59 844	43	46 550	77.7	64 - 76
5. Walpolayaya (NLDB)	129 116	56	108 960	84.0	55 - 74
6. Walahapitiya	73 172	61	62 455	85.3	81 - 85
7. Letchemy	101 078	62	85 440	84.5	81 - 84
8. Keenakelle	50 842	66	45 175	88.2	88 - 90
9. Bowatte	52 255	69	47 550	90.0	88 - 90
10. St. Anne's	215 346	65	181 495	84.3	82 - 85
11. Dispensary	66 742	81	54 925	82.2	78 - 86
12. Midland	114 140	69	98 450	86.3	82 - 89
13. Fruit Garden	41 487	72	35 985	86.0	82 - 93
14. Kiniyama	95 302	27	80 745	74.7	76 - 80
15. Andigedera	46 125	21	39 685	86.0	88 - 90
16. Marandawila	294 264	39	221 260	75.1	63 - 92
17. Siringapatha	263 623	53	226 104	85.8	76 - 86

Table 15. *Seednut Selection at I.S.G., Ambakelle.*

	*CRIC 60 (T x T)**			*CRIC 65 (D x T)***		
Crop no.	*Heaped*	*Selected*	*Percent selection*	*Heaped*	*Selected*	*Percent selection*
1	23 031	18 199	79.02	27 019	23 300	86.2
2	22 697	17 871	78.74	18 162	15 400	84.8
3	79 265	65 560	82.71	22 365	18 758	83.9
4	109 984	89 660	81.52	6 006	4 805	80.0
5	115 801	94 877	81.93	7 799	6 200	79.5
6	66 351	56 247	84.77	31 284	26 316	84.1
Total	417 129	342 414	82.08	112 635	94 779	84.1

* Includes Ambakelle tall and Ambakelle special.

** Excludes fallen nuts except for sixth crop.

POLLEN AND POLLINATION

Pollen collection and issue - Details of pollen collection and issue are given in Table 16.

Pollen collection from Marandawila was discontinued in 1983. Pollen of the *typica* variety was collected during the year from 21 inflorescences from the following specially identified palms on fields nos. 1 and 2 at the Isolated Seed Garden, Ambakelle: Palm nos. of these palms were 1.06, 1.10, 1.12, 1.21, 1.22, 1.23, 2.01, 2.05, 2.13, 2.38, 2.39, 2.40, 2.43, 2.46, 2.55, 2.58 and 2.60.

A total of 634 ampoules of pollen adulterated with lycopodium powder were sealed.

Collection of dwarf pollen from Badndirippuwa Estate was discontinued and 29 palms on fields nos. 5 and 9 at ISG, Ambakelle were identified for this purpose. Details of palm nos. are given in Table 2. Sixteen inflorescences on these palms were used for pollen collection during the year. One hundred and eighteen ampoules of unadulterated pollen were sealed. Pollen from different palms of the same variety and form were mixed together, adulterated with lycopodium and re-sealed before issue.

Collection of San Ramon pollen from palms on field no. 16 at Bandirippuwa estate was also begun this year. Details of palms are given in Table 3. Twenty six ampoules of unadulterated pollen were sealed, pollen being collected from three inflorescences. Here again, pollen is mixed and adulterated with lycopodium before use in pollination.

Typica pollen was issued to Palugaswewa and Pitiyakande estates of JEDB and to the private estates Westerseaton and Walakumburumulla. *Nana* pollen was issued to Westerseaton estate during the early part of the year.

Controlled Pollinations - Programmes of controlled pollination are in progress at fields nos. 1, 2, 5 and 9 of the Isolated Seed Garden, Ambakelle, the Variety block, Bandirippuwa Estate, Dwarf palms block, Ratmalagara and a private garden in Colombo (Experiments 5.5 and 5.9).

M.H.L. Padmasiri and W.B.S. Fernando

RESEARCH NURSERY

Seednuts laid and seedlings issued - Most of the nursery work of the Division was carried out at the Research Nursery at Ambakelle. A limited number of self-pollinated variety nuts were laid at the Bandirippuwa nursery but this was discontinued due to rat damage. Seedlings for Experiment 5.1 were, however, raised at Bandirippuwa.

Details of seednuts laid and seedlings issued are given in Tables 17 and 18 respectively. Availability of planting material as at 31st December 1984 is indicated in Table 19.

Experiments 6.3 and 6.6 were in progress during the year.

Table 16. *Pollen collection and issue.*

	No. of ampoules		
	Typica	*Nana pumila*	*San Ramon*
Carried over from 1983	474	20	-
Sealed in 1984			
With lycopodium	634	67	51
Balance without lycopodium	-	96	14
Issued to estates			
At no charge	62	20	-
At Rs. 10/= per ampoule	250	-	-
Issued for pollination programme			
(1) at ISG	42	45	39
(2) at BE	-	-	1
Other uses (viability tests, demonstration, breakages etc.)	213	3	1
Balance as at 31.12.84.			
With lycopodium	541	19	10
Without lycopodium	-	96	14

Table 17. *Seednuts laid at Ambakelle and Bandirippuwa estate research nurseries.*

Variety Produced at ISG	*Source*	*Number of seednuts laid at*	
		ISG	*BE*
Tall x tall (CRIC 60 or Ambakelle tall)	ISG	21 646	-
Ambakelle special	ISG	3 693	-
Dwarf green x tall (CRIC 65)	ISG	3 162	-
Total from ISG		29 365	
From controlled Pollinations:			
Dwarf green	BE	5	8
	RE	6	-
Dwarf yellow	BE	9	2
	RE	6	-
Dwarf red	BE	75	64
	RE	3	33
King Coconut	BE	9	-
Nawasi Thembili	BE	2	-
Total variety nuts		115	107
Grand total	29 587		

Table 18. *Seedling issues from Ambakelle.*

Variety	*Issued to*				*Total*
	ISG	*Makanudra*	*GPB*	*through CRB*	
Ambakella special	2 038	400	-	-	2 438
Ambakelle tall (CRIC 60 or T x T)	2	750	-	1 836	2 588
Moorock tall	-	-	-	2 845	2 845
Dwarf green x tall (CRIC 65)	-	-	-	4 369	4 369
Dwarf yellow x tall (CRIC 65)	-	-	-	2 374	2 374
Dwarf green (self pollinated)	206	-	1	-	207
Total	2 246	1 150	1	11 424	14 821

Table 19. *Availability of planting material as at 31st December 1984.*

Variety	*Seednuts 0 - 5 months from laying*	*Seedlings over 5 months from laying*		*Total*
		in beds	*in polybags*	
Ambakelle special	2 666	1 221	511	4 398
Ambakelle tall (CRIC 60 or T x T)	-	17 948	698	18 646
Moorock tall	-	30	108	138
Dwarf green x tall (CRIC 65)	2 170	1 698	710	4 578
Dwarf yellow x tall (CRIC 65)	550	1 164	824	2 538
Other varieties	115	-	-	115
Total	5 501	22 061	2 851	30 413

Seednuts were laid and seedlings raised for the following:

(i) Planting at the isolated seed garden, Ambakelle, both replanting and filling of vacancies.

(ii) Evaluation of cultivars trial at different locations.

(iii) Nuts from controlled pollinations for new varieties block and dwarf palms block.

W.M.J. Karunaratne, M.H.L. Padmasiri and M.A.S. Fernando

EXTENSION ACTIVITIES

A number of advisory letters, offers of land for plus palms selection, requests for assistance in the identification of plus palms and in the training of pollinators, applications for pollen and seedlings were dealt with. Final year University students, Diploma students from the Schools of Agriculture at Kundasale, Angunakolapelessa and Aquinas College, trainees from the Coconut Development Training Centre and the National Institute of Plantation Management and many school groups were shown around the laboratory and informed of the activities of the Division. Some of these visited the Isolated Seed Garden at Ambakelle also.

Distinguished visitors included Her Excellency the Ambassador of the Republic of Cuba and the Hon. Minister of Coconut Industries who visited the Isolated Seed Garden in April. They were shown around the seed garden and demonstrations in emasculation and pollen processing were held.

A field day was organized at the Isolated Seed Garden at the end of July. About 100 farmers, CDOO, ADA Managers and officers from CRB and CCB attended. The Hon. Minister of Coconut Industries was the chief guest; the Secretary, Ministry of Coconut Industries and Chairman, CDA, Chairman/CRB and Chairman/CCB were also present. The staff were specially commended following this field day.

A refresher course in Nursery Management was organised for the Officers of the Coconut Cultivation Board at the Isolated Seed Garden, Ambakelle. The AGM (technical) together with his assistant, Area Regional Managers and Officers in Charge of the Nurseries participated. The programme occupied a full day and consisted of lectures and demonstrations. The first course given at the end of September was repeated in October so as to enable all those interested to attend.

LECTURES, SYMPOSIA, STUDY TOURS ETC.

Dr. M.R.T. Wickramaratne visited the Central Plantations Crops Research Institute (CPCRI) in Kasaragod, Kerala, India on a study tour in early January. This included discussions with the research staff, conducted tours of the laboratories and field plots and visits to the seed garden at Kidu and the substations at Shanthigodu and Vittal. She addressed a meeting of the study circle at CPCRI on her research work and the Advances in Coconut Breeding in Sri Lanka. She also visited the Hindustan Lever Research Centre in Andheri, near Bombay and St. Aloysius College, Mangalore to see the progress made in embryo culture and tissue culture of coconuts.

Dr. M.R.T. Wickramaratne participated in the third seminar on Biotechnology at the Institute of Fundamental Studies held in September. The theme for the seminar was "Drought resistance in Plants" and Dr. Wickramaratne spoke on "Developing drought tolerant planting material in some plantation crops of Sri Lanka".

Lectures for the Diploma in Plantation Management for the trainees from the National Institute of Plantation Management on Seednut Production, Controlled Pollination and Seedling Production were delivered by Dr. M.R.T. Wickramaratne, Mrs. V.K.R.S. Perera and Mr. R.R.A. Peries respectively.

Lectures on practical aspects of Coconut Botany were delivered at the District seminars organised by the Ministry of Coconut Industries by Mr. R.R.A. Peries at Kandy, Matara, Kurunegala, Panadura and Sapugaskanda and by Mrs. V.K.R.S. Perera at Kegalle.

Mr. R.R.A. Peries and Mrs. V.K.R.S. Perera were appointed visiting lectures at the Coconut Development Training Centre since March.

PUBLICATIONS

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Manthriratna, M.A.P.P. (1978) Intra-specific hybridization Page 6 of the Coconut palm (Cocos nucifera L.) in Sri Lanka. PJCS 3 (3): 29-38.

ACKNOWLEDGEMENTS

The assistance of the staff of the Genetics & Plant Breeding Division in compiling this report is gratefully acknowledged.

REPORT OF THE SOILS AND PLANT NUTRITION DIVISION

Head - M. Jeganathan, M.Phil.

GENERAL :

Mr. K.S.O. Perera, Experimental Officer and Mr. P.J.E. Fernando, Laboratory and Field Assistant resigned from the service of the Institute on 31 May and 1 December, respectively.

Technical Assistants Messes. G.D. George, and T. W. Fernando, were promoted from, Class I to Special Class, and Miss. S. Periyathamby from Class II to Class I.

Mr. B.J.A.F. Mendis, Senior Technical Assistant, successfully completed a six month training (12 September, 1983 to 16 March, 1984) in the maintenance and Repair of Electronic Analytical Equipment at the Paddington College, London. On his return he completed a further one week course in Digital Electronics at the Tea Research Institute, Talawakelle.

Mr. D.P. Panditharatne, Technical Assistant, followed a training in the use of the Neutron Moisture Probe at the Land Use Division of the Department of Irrigation.

Mrs. N.H.R.M. Silva, Technical Assistant, obtained her B.Sc. as an external student of the University of Peradeniya.

LABORATORY AND GLASSHOUSE INVESTIGATIONS

STUDIES ON THE ESTIMATION OF SULPHUR AND ITS APPLICATION TO THE STUDIES IN COCONUT

These studies were initiated to test and evaluate analytical methods for rapid estimation of S in water, plant tissues and soils, and their application to studies on the S nutrition of coconut.

Of the methods evaluated, High Performance Liquid Chromatography was found to be rapid, accurate, sensitive and selective and suitable for rain water, nut water (ashed extracts) and soils. However, problems were encountered with extractants of high concentration for soils and leaf. Though the total S and water extractable S were correlated, the predictability was low (16%). Kernel posed sampling and digestion problems.

A study using soya as an indicator plant on a sandy loam - a typical coconut soil - showed that either water extractable S or total S could be used to evaluate the S status of Soya.

Recovery rates of extractable S for this particular soil using seven extractants showed a good interrelationship with each other, and the 100 ppm 'P' solution gave the best relationship with plant S.

Studies on leaf positions with respect to S indicated that the 6th leaf was sesitive and therefore suitable for diagnostic studies. Leaf S in the field experiments, showed no response to applied S in soil. In fact, the controls (no S) and the S treated palms showed similar concentration of leaf S. The same was observed with nut water.

Annual estimation for S in rain water, in six coconut growing areas showed that there is an adequate amount of S in the atmosphere to meet the requirements of coconut.

The results of these studies have been embodied into a thesis.

Malathi N. Dias

RESEARCH PROJECTS

PROJECT 7 - Nutrient Requirements of Coconut.

Experiment 7.1 : Effect of NPK fertilizer and organic manure on young coconut (CRIC 65) (SPN 5) at Bandirippuwa Estate, Lunuwila (1979).

This experiment was initiated in August 1979 to determine the effect of three levels of an inorganic fertilizer mixture, at different rates of increment with age, on the growth and yield of young hybrid palms (second plantation, Dwarf x Tall CRIC 65).

At the end of the fourth year, in August 1983, flowering showed no difference between treatments T_2 and T_3 where the cumulative total of fertilizer applied was 4.56 and 9.12 kg/palm. The CRIC 65 is early flowering and high yielding and is expected to complete flowering at the end of the 4th year under these conditions. The experiment was therefore modified at the end of 1983 and all palms were given a uniform application of 4.5 kg/palm/year of the CU-1 mixture to test the residual effect of the booster dosages received during the four year period, on the future performance of the palms.

At the end of 1984, the percentage of palms in bearing, flowering and still-to flower is given in Table 1.

Table 1. *Percentage of palms in bearing, flowering and not in flower.*

Treatment	*Cumulative total of fertilizer applied (1979 - 1983)* Kg/palm	*% palms in bearing*	*% palms in flower*	*% palms to flower*
T_1	2.28	68.5	22.2	9.3
T_2	4.56	79.6	7.4	13.0
T_3	9.12	72.2	11.1	16.7

Summary of the overall results show that of the total number of effective palms in the experiment, 73.4% are in bearing, 13.5% in flower and 12.9% remains to flower.

The fertilizer mixture consisting of urea, of concentrated super phosphate and muriate of potash in the ratio 2 : 1 : 3 and applied at the rate of 960g/seedling in the first year and stepping up in increments of 120g/year (T_2) gave the best performance at the end of 1984.

M. Jeganathan and Malathi N. Dias

Experiment 7.2 : N P K Mg response curve experiment in dry zone, sandy soil, at the Passi-
(SPN 6) kudah Research and Demonstration Farm, Kalkudah (1982).

The experiment had to be concluded in early 1984, as 8 of the 54 plots experienced water logging causing heavy casualities in seedlings.

M. Jeganathan

Experiment 7.3 : Modified response curve experiment on Adult palms,
(SPN 1.) (a) at Bandirippuwa Estate (1979).

The sixth year of manuring according to the modified treatment was done.

The yield data for the period of October, 1983 to September, 1984 (four years after modification) are given in Table 2.

Table 2. *The effect of withdrawal and restoration of fertilizer on yield of copra.*

(a) Withdrawal of fertilizer

Plot No.	*Before modification*	*After modification*	*Yield of Copra (kg/ha/yr)*	
			1979	*1984*
19	$N_3P_3K_3$	$N_3P_3K_3$	1050	525
38	$N_0P_3K_3$	$N_0P_3K_3$	1358	1079
15	$N_1P_3K_3$	$N_0P_0K_0$	1000	435
49	$N_2P_3K_3$	$N_0P_0K_0$	1081	597

(b) Restoration of fertilizer

Plot No.	*Before modification*	*After modification*	*Yield of Copra (Kg/ha/yr)* 1979	1984
35	$N_0P_0K_0$	$N_0P_0K_0$	440	128
61	$N_3P_0K_0$	$N_3P_0K_0$	194	75
9	$N_1P_0K_0$	(1.575 kg SA; 0.9 kg SP; 1.575 kg MP).	345	515
22	$N_2P_0K_0$	(- do -)	235	371

The data indicate that suspension of fertilization reduced the yield of copra, and when restored increased the yield.

(b) At Ratmalagara Estate.

Regular yield records were maintained, and fertilizer application according to the modified treatments was done in November, 1984.

The yield data for the period September, 1983 to August 1984 are given in Table 3.

Table 3. *The effect of withdrawal and restoration of fertilizer on yield of copra.*

(a) Withdrawal of fertilizer

Plot No.	*Before modification*	*After modification*	*Yield of copra (copra kg/ha/yr)* 1979	1984
16	$N_3P_3K_3$	$N_3P_3K_3$	2105	1893
22	$N_3P_2K_3$	$N_3P_2K_3$	2316	1951
38	$N_3P_3K_3$	$N_0P_0K_0$	1812	1692
49	$N_3P_2K_3$	$N_0P_0K_0$	1859	1704

(b) Recovery after restoration of fertilizer

8	$N_1P_1K_1$	$N_1P_1K_1$	2166	1832
26	$N_1P_2K_1$	$N_1P_2K_1$	1721	1524
28	$N_1P_1K_1$	$N_3P_3K_3$	2102	1921
50	$N_1P_2K_1$	$N_3P_3K_3$	1506	1589

As at Bandirippuwa Estate a similar overall trend was observed here, the withdrawal of fetilizer reducing yields of copra and the restoration showing an increasing trend in yields.

Experiment 7.4 : Effect of nitrogen and potassium on adult coconut 3 x 3 NK experiment at (SPN 3) Kobeigana Estate, Hettipola (1978).

The experiment is to determine the yield response of adult coconut to the application of N and K fertilizer to assess the optimum levels of fertilizer application on a lateritic gravelly soil (Red Yellow Podzolic) in the intermediate rainfall zone.

Table 4. *Effect of Nitrogen and Potassium on yield of nuts (nuts/ha/yr - 160 palms/ha).*

Sulphate of Ammonia kg/palm/yr	*Muriate of Potash kg/palm/yr*		
	0	1	2
0	7440	6440	7113
1	6900	7413	7266
2	7660	7933	8126

Although this experiment was initiated in 1978 and now completes 7 years, the yield records in terms of copra was commenced with the 2nd pick of 1984.

M. Jeganathan and Malathi N. Dias

Experiment 7.5 : Three forms of N, Ammonium chloride, Ammonium sulphate and Urea at (SPN 7) Mannakkulama Estate, Kakkapalliya (1976).

The 8th annual application of fertilizer was postponed to early 1985 due to the non-availability of ammonium chloride.

The yield data for the period November 1983 to October 1984 are shown in Table 5.

Table 5. *Effect of forms and levels of N on yield of nuts (nuts/ha/yr - 160 palms/ha).*

Levels	*Ammonium sulphate*	*Urea*	*Ammonium chloride*
0	8147	9284	8084
1	9364	9880	10413
2	10489	10471	10689

The results showed a significant linear response (P = 0.001) to nitrogen but showed no differences to the three sources of nitrogen.

In this experiment too the yeild records in terms of copra were maintained from the 2nd pick of 1984.

Malathi N. Dias

Experiment 7.6 : Levels of organic manure (goat dung) and inorganic supplements (1984).

Three experiments were commenced for these studies representing typical coconut growing soils of the Intermediate and Wet Zones, in order to determine the rate of supplementation of organic manure (goat dung) with inorganic fertilizers.

7.6.1 Heemmaliyagara Estate, (Hiruwalpola), lateritic gravel, Intermediate Zone

7.6.2 Sirikandura Estate, (Dodanduwa), lateritic gravel, Wet Zone

7.6.3 Kiniyama Estate, (Weerapokuna), sandy loam, Intermediate Zone.

The experimental layout is a randomised block design with three replicates, with each block made up of 15 plots and each plot having 8 effective palms. However, the experiment at Sirikandura Estate is made up of 7 plots per block, modified to meet the available land.

The treatment combinations are given in Tables 6, 7 and 8. The treatments for the different experimental sites were based on current CRI recommendations applicable to the soil types selected and agroclimates. Appropriate adjustments have been made to accommodate organic manure supplementation (goat dung) based on the amount of nutrient composition of the dung for N (2.50%), P (0.55%) and K (1.25%).

Representative leaf and soil samples, from each treatment, were collected from the 14th leaf of palms and their manure circles (area around the palm upto a distance of 1.75 m from the base of the palm) at depths 0 - 25 and 25 - 50 cms.

Analysis of the samples were in progress at the end of the year for determination of the nutritional status. Differential treatments will be imposed thereafter.

R. T. Shanmuganathan and N.A. Tennakoon

Experiment 7.7 : Nutrient requirements of coconut based on soil and tissue analysis.

(a) Two studies (20 and 405 ha, plantations) on sampling procedures, to determine the optimum sample size required, for the application of soil testing and leaf analysis to evaluate the nutrient status for fertilizer recommendation, were carried out.

The soil and leaf samples collected (504 and 470 respectively) were analysed for various parameters and submitted for statistical analysis. This is in progress.

(b) Under the FOA Small Farmer Fertilizer Project, 757 soil samples were analysed for Particle Size Distribution, p.h Electrical Conductivity, Total N, Available P and TEB; and in 1276 leaf samples total N, P, K, Ca and Mg from the 212 sites initially selected under the project.

The results of the chemical analysis done have been submitted to the FAO A Co-ordinator of the Project for statistical analysis.

The yield records for this project are maintained by the Coconut Development Officer of the Coconut Cultivation Board. At the end of 1984, the position regarding the sites was reviewed and 137 selected for continuation.

M. Jeganathan

Table 6. *Experiment 7.6.1 - Organic Manure (Goat Dung) Supplementation with Inorganic Fertilizers.*

Location : Heemeliyagara Estate, Hirwalpola.

	Rate of fertilizer g/palm/year.														
Treatments	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}	T_{15}
Urea	0	700	1050	0	240	480	0	130	260	0	0	50	0	0	0
Goat dung*	0	0	0	6	6	6	12	12	12	18	18	18	24	24	24
Saphosphosphate	0	700	1050	0	260	520	0	165	330	0	75	150	0	0	0
Muriate of potash	0	1600	2400	0	730	1460	0	665	1330	0	600	1200	0	535	1070
Dolomite	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500

* Rate - kg/palm/year.

T_2 - CU_1 mixture (Recommended dosage).

T_3 - CU_1 " (1.5 x Recommended dosage).

Table 7. *Experiment 7.6.2. - Organic Manure (Goat Dung) Supplementation with Inorganic Fertilizers.*

Location · Srikandura Estate, Dodanduwa.

Treatment	Rate of Fertilizer g/palm/ year						
	T_1	T_2	T_3	T_4	T_5	T_6	T_7
Urea	0	700	1050	480	260	50	0
Goat dung*	0	0	0	6	12	18	24
Saphos phosphate	0	700	1050	520	330	150	0
Muriate of potash	0	1600	2400	1460	1330	1200	1070
Dolomite	0	500	500	500	500	500	500

* Rate - kg/palm/year.

T_2 - CU_1 mixture (Recommended dosage).

T_3 - CU_1 mixture (1.5 x Recommended dosage).

Table 8. *Experiment 7.6.3 - Organic Manure (Goat Dung) Supplementation with Inorganic Fertilizers.*

Location : Kiniyama Estate, Weerapokuna.

	Rate of fertilizer g/palm/year														
Treatments	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}	T_{15}
Urea	0	500	750	0	180	240	0	35	70	0	0	0	0	0	0
Goat dung*	0	0	0	6	6	6	12	12	12	18	18	18	24	24	24
Saphosphosphate	0	600	900	0	210	420	0	120	240	0	30	60	0	0	0
Muriate of potash	0	900	1350	0	385	770	0	315	630	0	250	500	0	185	370
Dolomite	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500

* Rate - kg/palm/year.

T_2 - CU_2 mixture (Recommended dosage).

T_3 - CU_2 " (1.5 x Recommended dosage).

Experiment 7.8 : Effect of chloride and sulphate of K, Mg and Na on the yield of coconut at Heemaliyagara Estate, Hiruwalpola (1984).

An experiment was laid out in a sandy clay loam with lateritic gravel in the Intermediate Zone to study the effect of chloride and sulphate of K, Mg, and Na on the yield of coconut.

Table 9. *Effect of Chloride and Sulphate of K,Mg and Na on the yield of coconut.*

	Treatments		
	Control	-	T_1
	U + SP	-	T_2 700 g + 700 g
	L_1	-	T_3 0.800 kg/palm/year
KC1			
	L_2	-	T_4 1.600 kg/palm/year
	L_1	-	T_5 0.627 "
NaC1			
	L_2	-	T_6 1.254 "
	L_1	-	T_7 0.511 "
$MgC1_2$			
	L_2	-	T_8 1.022 "
	L_1	-	T_9 0.937 "
K_2SO_4			
	L_2	-	T_{10} 1.874 "
	L_1	-	T_{11} 0.762 "
Na_2SO_4			
	L_2	-	T_{12} 1.524 "
	L_1	-	T_{13} 0.646 "
$MgSO_4$			
	L_2	-	T_{14} 1.292 "

From T_3 to T_{14} a basal application of U and SP as T_2.

The experimental desgin consists of a randomised block with 3 replicates. Each block consists of 14 plots, with 8 effective palms in a plot. The treatment combinations are shown in Table 9.

Soil and leaf samples were collected to represent each plot and the procedure of sampling was as laid down under Experiment 7.6. Chemical analysis for all major nutrients in both soil and leaf was proceeding at the end of the year to determine the nutritional status before differential treatments are imposed.

Application of fertilizer treatments in this experiment will be undertaken in April/May 1985.

R. T. Shanmuganathan

Experiment 7.9 : Levels of K and Mg on the yield of coconut (1984).

Two experiments 7.9.1 and 7.9.2 were commenced on adult coconut in lateritic gravels, in the Intermediate (Heemmaliyagara Estate, Hiruwalpola) and Wet Zone (Sirikandura Estate, Dodanduwa) respectively to study the interactions of K and Mg on the yield of coconut. This is necessary in view of the widespread surfacing of Mg deficiency in coconut growing areas in Sri Lanka.

The experimental layout is a 4 x 4 factorial design with three replicates, each consisting of 16 plots of eight effective palms.

The teatments consist of muriate of potash (60% K_2O) and kieserite (24% MgO) tested at four levels with a basal application of urea and saphosphosphate in the proportion recommended in the CU-1 mixture.

Levels of Muriate of Potash and Kieserite
(kg/palm/year)

Levels	Muriate of potash	Kieserite
1	0.0	0.0
2	1.2	0.6
3	2.4	1.2
4	3.6	1.8

A basal application of urea and saphosphate at the rate of 0.7 kg each per palm per year is incorporated with the treatments.

The experiments were laid down in September, 1984. At Sirikandura Estate, Dodanduwa the 4th level of treatment had to be dropped as land was insufficient.

Soil and leaf samples from the experiment were collected in September, 1984. Soil samples were collected from two depths, 0 - 25 cm and 25 - 50 cm, of the manure circle of the palms from which the 14th leaves were sampled, representing the plots.

Chemical analysis of these samples are in progress for K, Ca, Mg and C1.

The first differential fertilizer application was completed at Heemmeliyagara Estate in December, 1984. Fetilizer application at Sirikandura Estate wil commence in January, 1985.

Yield in terms of nuts and copra are being maintained.

M. Jeganathan and Malathi N. Dias

ANALYTICAL CHEMISTRY

The Analytical Chemistry Laboratory undertook the chemical analysis of soil and leaf samples from the ongoing Research Projects and also fetilizer samples for quality standards.

Soil analysis	—	The laboratory presently undertakes determination for pH, electrical conductivity, organic matter, total N, available P, available S, Cation Exchange Capacity, Total Echangeable Bases and water soluble chloride.
		3062 soil samples were analysed covering specific requirements.
Leaf analysis	—	2327 leaf samples were analysed for total N, P, K. Ca and Mg; 338 for S and 158 for Cl.
Special analysis	—	370 samples (276 nut water, 40 kernel and 54 copra) were analysed for S.
Fertilizer analysis	—	230 fetilizer samples were analysed for quality standards.

A draft laboratory manual on methods in soil analysis was prepared by L. L.W. Somasiri, T.W. Fernando and S. Periyathamby.

M. Jeganathan

Visits, lectures and symposia

Mr. M. Jeganathan presented two papers at the 40th Annual Sessions of the Sri Lanka Association for the Advancement of Science, December, 1984 on :

- Leaf sampling of coconut for nutritional studies irrespective of leaf age and season - preliminary observations.
- Leaf sampling of coconut for micro-nutrient evaluation.

Dr. R.T. Shanmuganathan presented a paper at the Theme Seminar "Strategies for science to the 21st century" conducted by the Section B of the Sri Lanka Association for the Advancement of Science on "Modification of soil physical properties" held on 16 November, 1984.

Dr. R.T. Shanmuganathan and Mr. M. Jeganathan took part in the first Quarterly Seminar conducted by the Coconut Research Institute on "Drought and Coconut Production" held on 7 March, with their contributions on :

- Effect of drought on soil properties.
- Nutrition of coconut under stress conditions.

Mr. M. Jeganathan and Miss. Malathi N. Dias jointly contributed to the second Quarterly Seminar "Fertilizer Usage in Coconut" on the topic, 'Review of development of fertilizer for coconut' held on 5 September.

Acknowledgement :

Mr. D.T. Mathes, Officer in Charge, Biometry Unit for design of experiments and for the statistical analysis of the data.

REPORT OF THE CROP PROTECTION DIVISION

Head – P. Kanagaratnam, Ph.D.

GENERAL

Prof. W. J. Kloft, Director, Institute of Applied Biology, University of Bonn, West Germany, visited the Institute as an expert of the International Atomic Energy agency, to work on the project, Radiation Entomology (SRL/5/017), from 4 - 31 March. He was accompanied by Mrs. Erika Kloft. They carried out preliminary radio ecological experiments with the assistance of divisional staff on the Red Palm Weevil, *Rhynchophorus ferrugineus* Fabr.

Prof. M. J. Way of the Imperial College of Science and Technology, University of London, visited the Division in June to study the pests of coconut and their damage in Sri Lanka, to prepare for a collaborative project between the Silwood Centre for Pest Management, Ascot, England and the Institute to be submitted to the Council of European Communities for financial support.

Mr. Premalal Abeywickrema, Laboratory and Field Assistant was temporarily transferred to the East Coast Rehabilitation Project in February. Mr. Boniface Silva, Laboratory and Field Assistant was transferred to the Division of Estate Management in July.

RESEARCH PROJECTS

Project 8 : Population dynamics and pest/parasite complex of the coconut caterpillar.

Experiment 8.1 : The effect of humidity and temperature on population fluctuations of Opisina arenosella (1984).

The objectives of this experiment were to investigate the extent to which, if any, changes in temperature and humidity affect the population of *O. arenosella* and its parasites. The experiment could not be carried out due to defects in the equipment.

P.A.C.R. Perera

Experiment 8.2 : The effect of nutrient status of plant and variety on susceptibility to pest attack. (1984)

In coconut caterpillar infested estates some palms appear to be resistant to pest attack. This experiment was designed to investigate whether this apparent resistance could be related to the nutrient status of the plams or to variety and genetic constitution. The treatments, listed under nutrients and varieties are as follows:

	Nutrients		*Varieties*
1.	+ All nutrients	1.	Apparently resistant palms
2.	– Nitrogen	2.	Ordinary Tall

3.	– Phosphorus	3.	CRIC 65
4.	– Potassium	4.	CRIC 60
5.	– Calcium	5.	Dwarf
6.	– Magnesium		
7.	– Micronutrients		

The nutrient applications have been carried out thrice weekly in sand culture from May 1984 and the plants would be ready for testing in mid 1985.

P.A.C.R. Perera, K.F.G. Perera, K.A.S. Chandrasiri

Experiment 8 . 3 : The introduction of Antrocephalus pandens (Chalcididae) for the control of Opisina arenosella. (1984)

Brachymeria nephantidis (Chalcididae) is an indigenous pupal parasite with moderate to good parasitisation of *O. arenosella* in Sri Lanka. *Antrocephalus pandens*, identified by Indian scientists as *Brachymeria nosatoi*, is a pupal parasite of *O. arenosella*, reported to be effecting very satisfactory control in India. A consignment of this parasite was obtained from the CPCRI Kayangulam, India in late 1982 for testing, multiplication and subsequent introduction to affected areas. During the preliminary testing the parasite was found to parasitise pupae of both *O. arenosella* and *Corcyra cephalonica*. Mass breeding of this parasite on *C. cephalonica* was done in the insectary and a total of 8025 adult *A. pandens* of both sexes were released in slected estates in the North Western and Western provices. Regular bimonthly collections of *Opisina* pupae were made from the release areas but so far no recoveries of *A. pandens* have been made from any of these areas. Studies on the biology of *A. pandens* were done under laboratory conditions, (temperature, 25°C to 29°C; relative humidity 52% to 95%) and compared with similar studies done for *B. nephantidis*. The results of these studies are summarised in Table 1.

Table 1. *Life cycle of Brachymeria nephantidis and Antrocephalus pandens.*

Parasites	*Incubation Period (days)*	*Larvel Period (days)*	*Pupal Period (days)*	*Average Adult in cocoon (days)*	*Av. adult Longevity at 30°C*	
					♂♂	*♀♀*
B. nephantidis	2	5	5	2	3.1	6.6
A. pandens	2	6	9	2	5.4	4.9

Table 2. *The effect of host (Corcyra pupa) age on parasitisation by B. nephantidis.*

Age of pupa	% *parasitism*	*males*	*females*
Early pupal	20	20	0
One day	40	30	10
Two days	10	0	10
Three days	10	0	10
Four days	0	0	0

Table 3. *The effect of host (Corcyra pupa) age on parasitisation by A. pandens.*

Age of pupa	% *parasitism*	*males*	*females*
Early pupal	30	0	30
One day	50	0	50
Two days	30	10	30
Three days	50	40	10
Four days	40	10	30

Some observations recorded from these studies are:

(1) Percent parasitism both with *B. nephantidis* and *A. pandens* mated 00 is highest with one day old *Corcyra* pupae. Average recorded is 40% for *B. nephantidis* and 50% for *A. pandens.*

(2) With increasing age of pupa there is a tendency for production of more females than males with *B. nephantidis* and more males than females with *A. pandens.*

(3) The average egg to adult period for *B. nephantidis* females is 16.0 days and for males it is 15.6 days. With *A. pandens* the average egg to adult period for females is 19.3 days and for males it is 20.8 days.

These studies have enabled the selection of host pupae of the correct stage for parasitisation, thus increasing laboratory parasitisation for both *B. nephantidis* and *A. pandens* from about 40 to around 75%.

P. A. C. R. Perera, K. F. G. Perera and K. A. S. Chandrasiri

Experiment 8.4 : Semi-synthetic and synthetic diets for breeding spodoptera litura and Opisina arenosella.(1984)

Pupae of *Spodoptera litura* are being used in the routine mass breeding of the pupal parasite *Trichospilus pupivora.* A regular supply of uniformly developed, disease-free pupae is an essential requirement in this programme. Such pupae could be obtained through a perfected artificial diet.

Field populations of *Opisina arenosella* fluctuate drastically. A regular supply of uniformly developed *O. arenosella* larvae and pupae would be of immense benefit in the conduct of planned laboratory and field experiments.

This experiment was designed to evolve synthetic or semi-synthetic diets for *S. litura* and *O. arenosella.*

Standard insect diets consisted of a carbohydrate base to which was added necessary vitamins, anti-bacterial and anti-fungal compounds, agar, yeast and finely ground coconut leaf lamina. Modifications of this basic diet using different carbohydrate sources such as, Maize (*Zea mays*), Soya bean (*Glycine max*), Bengal gram (*Cicer arietinum*), Kurakkan (*Eleusine coracana*), Mung bean (*Phaseolus mungo*) and variations in amount of agar and ground coconut leaf and coconut cotyledon were tested. The early drying of the diet was a problem and a number of containers viz. glass petri dishes, plastic boxes (completely sealed and with fine perforations), paper cups and large perspex jars were tried out.

These diets and the containers were tried out for both *S. litura* and *O. arenosella.*

S. litura larvae were reared from 1st instar to pupation on a semi-synthetic diet with a Soya meal base, but the resulting pupae were not as healthy as the control fed on Castor leaves. The pupae were lighter (0.343 g) than those reared on Caster leaves (0.422 g). Some pupae were found to be deformed. *O. arenosella* larvae were reared from early 5th instar to pupation (survival 28%) also using a Soya meal base diet. Second and third instar *O. arenosella* larvae however did not survive to pupation. These trials are being continued.

P. A. C. R. Perera, K. F. G. Perera and K. A. S. Chandrasiri

Experiment 8.5 : Evaluation of the functional responses of four parasites of Opisina arenosella.

O. arenosella has a complex of both indigenous and introduced parasites. A knowledge of the relative effectiveness of the different parasites is essential to formulate a more effective control programme. This could be done through functional response studies and estimations of relative searching efficiency. The four more frequently occurring parasites, *Eriborus trochanteratus, Perisierola nephantidis, Trichospilus pupivora* and *Brachymeria nephantidis* were selected for this study. The investigations cover larval densities ranging from 5 to 80 where parasitisation rates at different densities would be evaluated. The experimental design is a randomised block with 6 replicates. This work is in progress.

P.A.C.R. Perera and K.A.S. Chandrasiri

Project 9 : Evaluation of systemic insecticides for the control of foliar pests of coconut.

Experiment 9.1 : Evaluation of techniques of treating coconut palms with systemic insecticides and their persistence in the palm. (1984)

This experiment was set up to evaluate following techniques of insecticide application.

1. application on trunk surface,
2. direct feeding through exposed roots,
3. injection into bole region,
4. injection into trunk,
5. drenching around palm base,
6. drenching into the crown,
7. leaf axil placement of granular insecticides.

The techniques were tested with monocrotophos at two estates, one in the North Western Province, (N.W.P.) and the other in the Western Province, (W.P.). In the estate in the N.W.P., 64 palms infested with coconut caterpillar were selected. A randomized block design was used. There were eight treatments including control. Each treatment was replicated eight times. In the estate in the W.P. 48 palms were selected, for the same treatments but replicated six times.

Observations on the insecticidal effect on natural population of caterpillars were taken from the palms used in the experiment by examining samples of caterpillar infested leaflets before and after treatment at weekly intervals. From these palms samples of leaflets were also collected at weekly intervals for six months, fed to caterpillars in the third instar and their mortality assessed in the laboratory. The results are being analysed.

Preliminary studies on trunk injection

The above experiments were preceded by trials to evaluate the effect of trunk injections of monocrotophos on 15m tall palms. In an estate in the North Western Province, nine caterpillar infested palms were selected. Of these, three untreated palms were used as control; three palms were injected with undiluted 5 ml (3.0 g a.i.) per palm and the balance three palms were

injected wih undiluted 10 ml (6.0 g a.i.) per palm of 60% monocrotophos. The insecticide was applied into a hole 15 cm deep, drilled at an angle of 45° to the horizontal at a height of one metre from the ground level.

Pre-treatment assessment of populations of live larvae and pupae was done by examining a sample of 30 pest infested leaflets per palm collected from all the palms before injection. Post-treatment observations were also taken as above at weekly intervals upto about seven months after injection.

In addition, from each palm a sample of leaflets were collected at weekly intervals and fed to 20-30 field collected caterpillars in the third instar. The mortality of the caterpillars was recorded after feeding the leaf samples for four days. These observations were also continued upto about seven months after injection.

On control palms, the pest population was higher than on the treated palms. In the samples from the treated palms the pest was found in small numbers until ahout one month after injection. From 36 to 176 days after injection there were no live caterpillars and pupae in the samples from palms treated with the insecticide at 3.0 g and 6.0 g a.i. per palm. However, in the samples from control palms, the number of live caterpillars and pupae were always high upto 176 days after injection, indicating that in the treated palms, the insecticide was effective in killing the pest. The insecticidal effect on the leaves of treated palms appears to have persisted for about six months. Further it could be inferred that 3.0 g a.i. per palm could kill all the caterpillars in the crown of about 15 m tall palms.

In the biossay carried out in the laboratory with the leaf samples collected from the same palms, both treatments caused very high mortality of caterpillars from 23-74 days after treatment. On days 52 and 58 after treatment 100 per cent mortality was obtained in both treatments. This also shows that 3.0 g a.i. per palm is adequate to kill all the caterpillars in the crown of 15 m tall palms.

The trial described above was repeated with six uninfested palms about 20 m in height in the Bandirippuwa estate. Two untreated palms were used as control, two were treated each with 3.0 g a.i. (5 ml) and two other palms each with 6.0 g a.i. (10 ml) of undiluted 60% monocrotophos. Pre and post treatment observations were taken in the laboratory by feeding caterpillars with leaf samples collected from the palms as described in the earlier experiment at weekly intervals for six months after injection. On days 40 and 47 after injection of 3.0 g a.i. per palm, complete kill of the caterpillars was obtained. The insecticidal effect in the leaves appeared to have persisted for about five months in palms treated with 3.0 g a.i. per palm and about six months when injected with 6.0 g a.i. per palm.

Pesticide Residue Analysis

In collaboration with the Ceylon Institute for Scientific and Industrial Research in Colombo, techniques are being developed for the analysis of pesticide residues in edible parts of coconut in palms treated with monocrotophos.

P.Kanagaratnam, L.C.P. De Silva, J.L.J.G. Pinto and I. Alwitigala

Experiment 9.2 : Evaluation of systemic insecticides for the control of Oryctes rhinoceros in coconut seedlings and young palms. (1984)

Frequent application of non-systemic, contact, stomach and fumigant insecticides is inconvenient. Further in areas with frequent rainfall these insecticides after application on the plant could be washed away. In contrast, systemic insecticides would be absorbed and retained in the plant sap for a few months, and hence less frequent application may be possible. In this experiment, the effect of systemic insecticides would be compared with the other insecticides, which are recommended for use against the black beetle. The insecticides being evaluated are monocrotophos, methamidophos, oxydemeton-methyl, carbofuran, aldrin, gamma B.H.C. and napthalene.

An experiment in a randomized block design was set up with eight treatments and five replicates at Kohombe estate, Kakkapalliya in the North Western Province Damage assessment in the crowns of selected young palms was made before the insecticides were applied and the palms were grouped into blocks according to the degree of damage to the fronds. The insecticides were applied at the rate of 6.0 g a.i. per palm, into the leaf axils around the spear. The application of insecticide and the post treatment damage assessment would be repeated once in three months for a duration of two years.

P. Kanagaratnam, L. C. P. De Silva and J. L. J. G. Pinto

Project 10 : Studies on pests of the coconut inflorescence and developing fruit.

Experiment 10.1 : Survey of pests of the coconut inflorescence and developing fruit.

At Bandirippuwa estate, Lunuwila, Isolated Seed Garden at Ambakelle, Rajakadaluwa, Kirimetiyana estate, Lunuwila, many species of harmful and beneficial insects (parasites and predators) were collected manually from the inflorescence and developing fruits at regular intervals through-out the year. These were identified with the assistance of the British Museum. The pests and their parasites/predators are listed below.

Pest	*Parasite/Predator*
MITE	
Dolichotetranychus sp. (Tenuipalpidae)	none
MEALY BUGS	
Pseudococcus cocotis (Maskell) (Pseudococcidae)	*Promuscidea unfasciativentris* (Girault) (Aphelinidae)
	Anagyrus sp. nr. *phseudococci* (Girault) (Encyrtidae)

	Platygaster sp. (Platygastridae)
	Coccodiplosis sp.* (Cecidomiidae)
	*Cryptogonus bryanti** Kapur (Coccinellidae)
	Pseudoscymnus sp.* (Coccinellidae)
Pseudococcus citriculus Green (Pseudococcidae)	*Promuscidea unfasciativentris* (Girault) (Aphelinidae)
	Coccodiplosis sp.* (Cecidomiidae)
	*Cryptogonus bryanti** Kapur (Coccinellidae)
	Pseudoscymnus sp.* (Coccinellidae)
Planococcus lilacinus (Cockerell) (Pseudococcidae)	none.
SCALES	
Coccus hesperidum (Coccidae)	*Scymnus (Pullus)* sp.* (Coccinellidae)
Aulacaspis sp. (Diaspididae)	*Pharoscymnus horni** Weise (Coccinellidae)
Aonidiella orientalis (Newstead) (Diaspididae)	*Telsimia ceylonica** (Weise) (Coccinellidae)
Pinnaspis strachani (Cooley) (Diaspidiadae)	*Cryptogonus bryanti** Kapur (Coccinellidae)
	Cybocephalus sp.* (Nitidulidae)
	Pseudoscymnus sp.* (Coccinellidae)

APHID

Cerataphis variabilis	*Cryptogonus bryanti**
Hille Ris Lambers (Aphididae)	Kapur (Coccinellidae)

*Predators of the pest.

No serious pest was encountered during the survey. Mild infestations of mealybugs and mites were common. Rarely, drying up of the inflorescence was caused by mealybugs. The mealybugs were kept under control in certain seasons when the naturally occuring Coccinelid and Cecidomyiid predators and hymenopterous parasites were abundant.

Mites (Dolichotetramychus sp.)

Mites caused superficial damage to the epicarp of the fruits. Occasionally, a few nuts were deformed due to severe infestation of young developing fruits. It appeared that some varieties of coconut were more tolerant to mite damage than the others. Therefore freshly harvested nuts from various varieties of coconut were examined for mite damage in October. The details are given in tables 4 and 5.

Table 4. *Presence of mite damage on freshly harvested nuts of different varieties of coconut.*

Variety	** % of nuts in which mite damage was present*
Ordinary Tall	74.9
Tall x Dwarf	74.7
Gon Thambili	62.5
Ran Thambili	26.8
Nawasi	95.4
San Ramon	77.0
Bodiri	7.1
West African Tall	100.0
Nawasi Thambili	94.4
King Coconut	100.0

* data of one observation.

It is evident that the varieties, King Coconut and West African Tall were the most susceptible to mite attack and Bodiri variety the least. The other varieties were also highly susceptible except Ran Thambili.

L. C. P. De Silva & P. Kanagaratnam

Project 11 : Biological control of black beetle.

Experiment 11.1 : Feasibility of using three pathogens for the control of Oryctes rhinoceros.

The usual practices for the management of *Oryctes thinoceros*, the black beetle pest of coconut are the application of chlorinated hydrocarbon insecticides to the bud region of seedlings and young palms and the destruction by burning of breeding grounds such as coconut logs and stumps. The destruction of breeding grounds is difficult during rainy weather, and can be expensive. Further, the grubs are also found in farm yard manure. Therefore the present study was undertaken to examine the feasibility of using the pathogens, *Baculovirus* of *Oryctes*, *Metarhizium anisopliae* and *Rhabditis* sp. close to *insectivora* to prevent the build-up of the beetle population.

One block at Bandirippuwa estate, which had many young bearing palms with black beetle damage, was selected for this study. Pre-treatment damage assessment was taken on 64 selected palms, which had damaged fronds. The degree of damage in 64 palms ranged from 18 - 100%. Among these, 27 palms had more than 75% fronds damaged by the pest.

Natural occurrence of pathogens among the grubs in the breeding grounds of the black beetle at the Bandirippuwa estate was studied by examination in the field. Two grubs due to infection by *Metarhizium anisopliae* and three grubs due to that of *Baculovirus* were dead among 73 grubs examined. There was no death due to infestation by the nematode.

Adult beetles and larvae infected by *Baculovirus* were released into the breeding grounds, near the palms used in the experiment. Further releases will be made frequently and the palms examined for fresh damage.

For characterisation of the virus, infecting the natural population of black beetles in Sri Lanka, samples of infected beetles and grubs were sent to Mr. C. J. Lomer of the Institute of Virology at Oxford, England. He used restriction endonucleases to characterise the virus DNA. According to his report, the enzyme EcoR I indicated that the Sri Lankan virus is of the Philippines and not Samoan type. The enzyme HPa II showed a unique profile for Sri Lankan virus (band e) and Xho I showed a similarity with Philippines X virus.

P. Kanagaratnam, L. C. P. De Silva, J. L. J. G. Pinto and I. Alwitigala

Project 17 : Studies on Premature Decline of Palms.

Experiment 17.2 : Studies on the association and influence of Odontomachus haematodes on Leaf Scorch Decline of coconut. (1984)

Preliminary investigations on the possible association of *O. haematodes* populations, nesting at the base of the coconut palm, with Leaf Scorch Decline indicated positive correlation ($P = 0.05$), and prompted the conduct of an experiment to ascertain whether *O. haematodes* causes the Leaf Scorch Decline of Coconut.

The insecticide Aldrin (20%) was applied in the soil at bimonthly intervals at the rate of 1 ml of commercial product in 1 litre water around the palm up to 1 metre from base with untreated palms as control, in a fully randomized design and records of vegetative and yield characteristics maintained at bimonthly intervals at Bandirippuwa Estate, Lunuwila.

P.A.C.R. Perera

MISCELLANEOUS EXPERIMENTS

Experiment CP 5 : Development of techniques of mass rearing of red weevil and sterilization of adults using gamma irradiation. (1982)

It was possible to rear red weevils from eggs to adults by feeding the adults and the larvae with sugar cane stem cuttings.

For mass rearing, male and female adult weevils were caged together and split pieces of sugar cane cuttings offered for feeding and oviposition. The eggs were collected by peeling off fibres from the sugar cane pieces, and left for hatching on moist filter paper in petri dishes. On hatching a single larva was transferred to one internode length of sugar cane cutting for feeding and development. The sugar cane cuttings were changed at 10 day intervals. The grown up larvae were supplied with larger cuttings with about 2 - 3 internodes, until pupation. To produce one adult, about 9 - 10 internode pieces were required as the duration of the larval stage is about 12 - 13 weeks.

The duration of development from egg to adult was about 15 weeks when fed either with sugar cane or with coconut petiole at the ambient temperature (26 - 29°C). Average weight of an adult weevil reared on sugar cane was 1.1. g and that on coconut petiole was 1.5 g. There were no major differences in the weights of various stages of the weevil when reared on sugar cane or on coconut petiole. Thus it appears that sugar cane is a suitable substitute for coconut petiole for the mass rearing of the weevil in the laboratory.

Sterilisation of newly emerged male weevils will be attempted at the Radioisotope centre of the University of Colombo.

As a part of this project, Prof. W. J. Kloft of the University of Bonn carried out some work on sterile insect techniques at the CRI. This work was supported by the IAEA.

(1) Studies on penetration of gamma rays through coconut timber

In these studies an attempt was made to estimate the penetration of gamma rays into discs of fresh and air-dried coconut palm timber. Radioactive Iridium. 192_{Ir} and Iodine, 131_{I} were used to emit gamma rays. The half thicknesses of the timber (which reduced the intensity of gamma rays to one-half of its original value) estimated from these studies were as follows:

Timber	192_{Ir}	131_{I}
Fresh wood	88 mm	870 mm
Air dried wood	100 mm	1060 mm

(2) Detection of radiolabelled weevils under field conditions

Adult weevils were labelled with small pieces of 192_{Ir} wire. These weevils were enclosed individually in small plastic bottles and used in the field experiments. A polyradiometer, to which the gamma-schintillator probe was attached was used to determine the distance upto which labelled weevils could be detected when kept behind the palm base. It was observed that the radiation emitted from labelled weevils could be detected even at a distance of 18 m from the weevils.

Although the weevils were labelled by inserting a piece of Iridium-192 into their thorax, they were able to fly.

P. Kanagaratnam & J.L.J.G. Pinto

Service and Extension activities.

The coconut caterpillar, *Opisina arenosella* Walker, (*Nephantis serinopa* Meyrick).

Inspections of caterpillar infested estates were made at regular intervals throughout the year to assess the populations of the pest and the parasites.

In the Eastern Province, the pest infestation was heavy in many estates throughout the year. In the Southern Province too the pest infestation was heavy in many estates until the third quarter of the year but later the population declined.

The pest population was high in a few estates in the Western and North Western Provinces at the beginning of the year but the infestation came under control by the middle of the year.

Parasites were mass reared in the laboratories at Lunuwila and Mylambawely and released in the caterpillar infested estates. The numbers of parasites released in different provinces for the control of the caterpillar are given in Table 6.

Table 6. *Numbers of parasites released in different provinces for the control of Opisina arenosella.*

	North Western Province	*Western Province*	*Southern Province*	*Eastern Province*
Goniouzus (Parasierola) nephantidis	134,500	145,000	77,750	150,450

Eriborus trochanteratus	1,445	4,375	8,000	12,625
Bracon hebetor	392,500	274,250	116,000	274,750
Antrocephalus pandens	3,375	4,650	nil	1,600
Brachymeria nephantidis	2,615	3,785	1,950	200
Trichospilus pupivora	258,800	405,650	21,325	21,600

In an estate at Ambalantota about 10 ha of coconut palms heavily infested with the caterpillar, *O. arenosella* were sprayed twice with the chemical insecticide, Carbaryl, as the pest was found in multiple stages. About 9 ha of caterpillar infested coconut palms at Polonnaruwa were also sprayed with Carbaryl. After the reduction of the caterpillar population by the insecticide spraying in the above lands, parasites were released regularly.

P. Kanagaratnam, P.A.C.R. Perera, M.S. Velu and V. Shivanandarajah

Resurgence of infestation of Promecotheca cumingi

In September, an infestation of *Promecotheca cumingi* was reported from Goluwa-pokuna Estate at Katunayake. The infestation was very mild, but initially there was no evidence of parasite activity. There were about 100 unparasitised mines in four palms from which all the fronds were cut and examined.

To prevent the spread of the pest, all the mature fronds of the infested palms were lopped and burnt. However the total number of palms lopped were less than fifty, as the infestation was confined to a small area.

In October, in a block, about 500 metres away from the original infestation, larvae parasitised by *Dimmockia javanica* were seen on young and mature palms. The pest was present in all the stages. The pest position was monitored weekly by taking population counts. The parasite population increased and the pest population decreased gradually.

By the end of The year, the spread of the pest was controlled. Samples collected from the field were almost always parasitised.

The natural enemies were able to build up after a few generations of the pest infestation and re-establish perfect control.

P. Kanagaratnam and M.S. Velu

Visits

Dr. P. Kanagaratnam, participated in the "Interregional training course on the use of isotopes and radiation in integrated pest management with special reference to the sterile insect technique" held at the Department of Entomology and Nematology, University of Florida, Gainesville, Florida, U.S.A., from 11 June to 3 August. The training course was organised by the International Atomic Energy Agency and the Food and Agriculture Organisation of the United Nations in Co-operation with the Government of the United States of America and the University of Florida.

Dr. P. Kanagaratnam and Mr. P. A. C. R. Perera attended the International Rubber Conference held in Colombo from 17 - 19 September.

Lectures

The following lectures were conducted for the Diploma students of the National Institute of Plantation Management in May.

1.	Diseases of Coconut	—	R. Mahindapala
2.	Principles of Crop Protection and Pests of coconut and their damages to coconut	—	P. Kanagaratnam
3.	Biological control of coconut pests.	—	P.A.C.R. Perera

At the second Quarterly Seminar of the institute held on 6 June on the theme "Pests, Diseases and their control" the following lectures were delivered.

1.	Common Diseases of Coconut	—	R. Mahindapala
2.	Management of Red weevil, Black Beetle and Coconut Scale	—	P. Kanagaratnam
3.	Biological control of the Coconut caterpillar and Coconut leaf miner.	—	P.A.C.R. Perera

Mr. P. A. C. R. Perera and Miss. L. C. P. De Silva conducted lectures on Crop Protection of Coconut in Sinhala to the Coconut Development Officer-trainees at the training school of the Coconut Development Authority, at Lunuwila.

Publications

In Coconut Bulletin/Pol Pawath/Tennai Takaval 1 (2) : the following articles were published.

Crop Protection of coconut	–	P. Kanagaratnam
Black beetle	–	P.A.C.R. Perera
Coconut caterpillar in conversation with a parasite	–	S. Chandrasiri
Red Weevil	–	J.L.J.G. Pinto
Crop Protection Service	–	D.M. Jayakody
Diseases of coconut	–	L.C.P. De Silva & R. Mahindapala
Biological control	–	P.A.C.R. Perera
If your palms are tapped	–	W.S.J. Fernando
Coconut caterpillar	–	M.S. Velu
Coconut scale and its control	–	K.F.G. Perera

ACKNOWLEDGEMENTS

We thank the British Museum for identifying our specimens of insects and mites.

REFERENCE

Kanagaratnam, P. (1976): Report of the Crop Protection Division – 1975. Ceylon Cocon. Q. 27, 36-41.

REPORT OF THE COCONUT PROCESSING RESEARCH DIVISION

Officer-in-charge – P.A.N. Ratnayake, B.Sc. (Eng)

General

Dr. S. Mohanadas, Head of the Division, resigned from the Institute service in June. Mr. W.D.J.A. Norbert, Assistant Technologist, and Mr. J.E. Premaratne, Lab & Field Attendant, resigned in August and February respectively.

Coconut Processing Research & Development Centre, Dunkannawa.

The management of the plantation was handed over to the Division of Estates Management from July, 1984.

The security of the Centre was handed over to a private firm from 1st September, 1984.

The construction of the following items was completed during the year.

1. Office building
2. Over head water tank and ground sump
3. Three phase electricity extension to the timber saw mill
4. Watchers hut. (at the gate)

The construction of the Timber Workshop is in progress.

RESEARCH PROJECTS

Project 13 : Desiccated coconut from unseasoned nuts and development of by-products.

Experiment 13.1 : Technology for the manufacture of desiccated coconut from unseasoned nuts.

The results of the trial, concluded in 1983 were conveyed to the Coconut Development Authority with the recommendation that a limited number of millers may be permitted to use fresh nuts for the manufacture of D.C.

S. Mohanadas

Experiment 13.2 : Mechanisation of extraction of white fibre.

White fibre is normally produced, as a cottage industry in the coastal areas, by manual extraction after retting the husks for 8 to 12 months. In experiment was commenced at Kurana Lagoon, Negombo to study the minimum retting period required for extraction with Sri Lanka drums. For this study 1000 green husks were submerged in the lagoon and at monthly intervals a sample of 25 husks was taken out and fibre extracted using the Sri Lanka drums.

The Experiment is in progress.

W.D.J.A. Norbert

Experiment 13.3 : Prevention of browning of white fibre – use of mild bleaching agents.

This experiment was carried out with white fibre extracted from green husks. Two grams of sundried samples were treated for different lengths of time using hydrogen peroxide and sodium hydroxide solutions of different concentrations at room temperature (28^{o} - 30^{o} c). After the treatment the samples were washed with water and then with 1.0% acetic acid solutions in order to neutralise the excess sodium hydroxide. Finally the samples were washed with pure water and sundried. The resultant fibre colour is given in Table 1.

The results indicate that hydrogen peroxide and sodium hydroxide at 1.0% and 0.125% concentrations, respectively, give satisfactory results most rapidly. This combination produces fibre of off white colour in three hours. Also, 1.0% H_2O_2 and 0.5% NaoH combination gives similar coloured fibres in six hours.

A similar experiment was carried out to investigate the action of bleaching powder and a mixture of H_2O_2 and NaOH in bleaching of brown fibre. In this trial, the samples treated with bleaching powder were washed with pure water only, directly after treatments.

At all the concentrations of the bleaching powder (i.e. 0.25%, 0.50%, 0.75%, 1.0%. 1.5%, 2.0% and 2.5%) 8h and 12h treatments produced brownish yellow fibre. Treatments with 0.25% and 0.5% solutions of bleaching powder for 8h, did not bleach brown fibre. All other concentrations up to 2.5% at 8h, 12h & 24h treatments produced fibre brownish pale yellow in colour.

The results of the experiment on bleaching brown fibre with a mixture of hydrogen peroxide and sodium hydroxide are presented in Table 2.

S. Mohanadas

Experiment 13.4 : Preparation of nut water beverage.

The coconut water used in this study was obtained from fresh mature coconuts from Bandirippuwa Estate. The coconut water was first filtered under pressure. The nut water from mature coconuts had a higher pH compared to young coconut water (Kurumba water), but contained less sugar.

Organic acids, which are commonly used in food preservation were used on a trial basis to determine the most suitable acid to use as an acidulant. 25% solution of acids were used to lower the pH to the desired values, viz 4.2, 4.0 and 3.8. Nut water of pH 4.2, adjusted with citric acid, was found to be the most agreeable, followed by nut water treated with Sorbic acid.

S. Mohanadas

Project 14 : Coconut Timber Technology.

Experiment 14.1 : Demonstration of techniques of saw milling, preservation and woodwork of coconut timber.

The installation of the saw mill was completed.

Project 15 : Use of off-cuts of coconut timber and coconut shells as source of energy.

Two low-cost drum kilns and two circular traditional pits were constructed. The smaller drum kiln (single drum kiln Ø 58 x 90 cm) has nine air inlet ports which are G.I. pipes (Ø 25 x 150 mm) complete with threaded cups to close the ports whenever necessary. These nine ports are in three rows and the ports in each row are equally spaced. In the larger kiln (double drum kiln Ø 58 x 180 cm) there are 24 inlet ports. Although the construction of these air inlet ports is similar to that of single drum kiln, the arrangement is as follows.

Bottom row (row - A)	–	Four inlet ports equally spaced (90^{o})
Second row (row - B)	–	Three inlet ports equally spaced (120^{o})
Third row (row - C)	–	Three inlet ports equally spaced (120^{o})
Fourth row (row - D)	–	Four inlet ports equally spaced (90^{o})
Fifth row (row - E)	–	Three inlet ports equally spaced (120^{o})
Sixth row (row - F)	–	Three inlet ports equally spaced (120^{o})
Seventh row (row - G)	–	Four inlet ports equally spaced (90^{o})

While the operation is carried out the inlet port which faces the wind direction is designated as 1. The port in row A facing the wind direction is A1. A2 is the port clockwise next to A1. To start the operation, fire is set to the initial load at the bottom of the kiln using kerosene oil, and all the ports are opened. Reloading is done when the flame is seen over the coconut shells in the kiln. When the charcoal is seen through any of the air inlet ports they are closed within five minutes. The flame over the coconut shells in the kiln is controlled by loading more coconut shells. After heaping over the brim of the kiln, the lid is placed and the kiln sealed once the shells are reduced to the brim level.

After 24 hours the kiln is opened and shell charcoal is seperated from ash and unburnt shells manually. The following observations are recorded from each trial.

(a) Loading pattern – Load and loading time.

(b) Inlet air regulating pattern – closing sequence of air inlet ports and closing time.

(c) Moisture content and shape of shells, (whether copra shells or D.C. shells).

(d) Moisture content of charcoal – (Oven dry method).

(e) Wet weight and dry weight of shells.

(f) Wet weight and dry weight of charcoal.

(g) Weight of unburnt shells.

The trials are in progress.

P. A. N. Ratnayake

Miscellaneous Experiment : Manufacture of good quality white edible copra.

Three trials were conducted in the standard copra kiln at Ratmalagara Estate, Madampe to ascertain the most efficient and economical method of producing good quality white edible copra.

The first trial was carried out using 1500 selected nuts. Coconut shell charcoal was used as fuel in place of coconut shells which are normally used in the manufacture of estate copra. After splitting (early in the morning), the nuts were sundried until 3.00 p.m. same day. Selected halves were taken to the kiln for white copra manufacture. After splitting, an average of about 80% nuts was found to be suitable for white copra manufacture. When split halves are loaded in the kiln the top layer of halves were arranged facing downward. Three fires ere applied in the following manner.

1st Firing – 85 kg of charcoal arranged in 2 rows (per chamber). With the first fire 400 g of powdered sulphur was burnt in the fire chamber in metal trays with some charcoal.

2nd Firing – 60 kg of shell charcoal arranged in two rows.

3rd Firing – 45 kg of shell charcoal arranged in two rows.

The rows of charcoal were arranged on the floor of the fire chamber along the length of the chamber, about 45 cm away from the partition walls. The rows were arranged about 30 cm apart from one another and the first fire took 26 hours to complete burning; the 2nd and 3rd fires took 24 hours, each. Fires were set one after the other without allowing a time interval in between to cool the copra. When copra was examined after drying by the above method most of the cups were found to be overdried.

In the second trial 2000 selected split nuts were used. After initial sundrying and stacking in the kiln as in the earlier trial, four fires were applied in the following manner.

50 kg in two rows for first fire
45 kg in two rows for second fire
40 kg in two rows for third fire
25 kg in two rows for fourth fire

In the first fire, 300 g of powdered sulphur was burnt in a tray. As in the 1st trial no time interval was allowed between fires, and shells were removed after the 3rd fire.

Copra dried by this method was found to be of very good quality, white coloured with an average moisture content below 6%.

The third trial was conducted using 1860 seasoned nuts selected after splitting. Initial treatment for split nuts was as in earlier trials. The amounts of charcoal used for fires were 45 kg, 40 kg, 40 kg and 20 kg respectively for four consecutive fires with 300 g of sulphur burnt with the 1st fire. The dried copra from this trial too were found to be of very good quality with a uniform white colour and an average moisture content of 5.76%. With this trial the experiment was concluded. The details of the 3rd trial are given in Table 3.

Firing schedule followed in the 3rd trial gave the best results and is suitable to process a charge of about 2000 split nuts to white copra, when 8 hours of sundrying is possible.

S. Mohanadas

Overseas Training

Mr. A. H. Norman, Technical Assistant, underwent a training course on Coconut Wood Utilization at Zamboanga Research Centre, Philippines, from 11th August, 1984 to 15th September, 1984.

Conference

Dr. S. Mohanadas and Mr. P.A.N. Ratnayake presented a joint paper titled "Treatment of Coconut Timber" on 26th October, 1984 at the International Timber Conference held at the University of Moratuwa.

Prevention of browning of white fibre (extracted from green husks) with H_2O_2 & NaOH

TREATMENT (Time in h in parenthesis)		RESULTANT COLOUR OF THE FIBRE
0.5% H_2O_2 + 0.25% NaOH (24)	0.5% H_2O_2 + 0.5% (24)	
0.5% H_2O_2 + 0.125% NaOH (24)	1.0% H_2O_2 + 0.125% NaOH (3)	
1.0% H_2O_2 + 0.125% NaOH (6)	1.0% H_2O_2 + 0.125% NaOH (24)	OFF WHITE
1.0% H_2O_2 + 0.25% NaOH (24)	1.0% H_2O_2 + 0.5% NaOH (6)	
1.0% H_2O_2 + 0.5% NaOH (24)		
0.5% H_2O_2 + 0.25% NaOH (5)	0.5% H_2O_2 + 0.5% NaOH (6)	
0.5% H_2O_2 + 0.125% NaOH (6)	1.0% H_2O_2 + 0.25% NaOH (3)	PALE YELLOW
1.0% H_2O_2 + 0.25% NaOH (6)	1.0% H_2O_2 + 0.5% NaOH (3)	
0.5% H_2O_2 + 0.5% NaOH (1)	0.5% H_2O_2 + 0.25% NaOH (2)	
0.5% H_2O_2 + 0.5% NaOH (3)	0.5% H_2O_2 + 0.125% NaOH (1)	BROWNISH YELLOW
0.5% H_2O_2 + 0.125% NaOH (3)		

All the trials were carried out at room temperature (28°C - 30°C)

Table 2. *Bleaching of brown fibre with Hydrogen Peroxide and Sodium Hydroxide*

Treatment (Time in h. in parenthesis)		*Resultant colour of the fibre*
0.25%H_2O_2 + 0.25%NaOH (0.5)*	0.25%H_2O_2 + 0.5%NaOH (0.5)*	Off white
0.5%H_2O_2 + 0.125%NaOH (0.5)*	0.5%H_2O_2 + 0.05%NaOH (24)	
0.5%H_2O_2 + 0.25%NaOH (24)	0.5%H_2O_2 + 0.125%NaOH (24)	
1.0%H_2O_2 + 0.5%NaOH (24)	1.0%H_2O_2 + 0.25%NaOH (24)	
0.5%H_2O_2 + 0.5%NaOH (6)	0.5%H_2O_2 + 0.5%NaOH (3)	Pale yellow
0.5%H_2O_2 + 0.25%NaOH (6)	0.5%H_2O_2 + 0.25%NaOH (2)	
0.5%H_2O_2 + 0.25%NaOH (5)	1.0%H_2O_2 + 0.5%NaOH (6)	
1.0%H_2O_2 + 0.25%NaOH (6)		
0.5%H_2O_2 + 0.25%NaOH (0.5)*		Creamy yellow
1.0%H_2O_2 + 0.25%NaOH (0.5)*		Yellow with light brown tinge
1.0%H_2O_2 (24) + 0.5%H_2O_2 (24)	0.25%H_2O_2 (24)	Brownish yellow
1.0%H_2O_2 (0.5)* + 0.5%H_2O_2 (0.5)*	0.25%H_2O_2 (0.5)*	
0.5%H_2O_2 + 0.25%NaOH (0.5)*	0.5%H_2O_2 + 0.5%NaOH (0.5)*	
0.5%H_2O_2 + 0.125%NaOH (6)	1.0%H_2O_2 + 0.25%NaOH (3)	
0.5%H_2O_2 + 0.125%NaOH (3)		Light Brown
0.5%H_2O_2 + 0.125%NaOH (1)		Brown

*These samples were boiled for the time period indicated in parenthesis.
All other samples were at room temperature (28°C - 30°C)

TABLE 3

	Treatment	Amount of charcoal	Firing time	Amount of sulphur and burning time	%moisture content
1st day	splting of nuts,sundrying 1st firing with burning of sulphur	45 kg	24 h	300 g 4h	15.67%
2nd day	turn the copra 2nd firing	40 kg	24 h	-	12.10%
3rd day	3rd firing	40 kg	24 h	-	8.87%
4th day	removing the shells	-	-	-	-
6th day	4th firing	20 kg	24 h	-	5.76%

REPORT OF THE BIOMETRY UNIT

Officer-in-charge – D.T. Mathes, F.I.S.

GENERAL

Mr. W. P. T. Perera Lab/Field Asst. resigned with effect from 12th December. Messrs. E. Ranjith Fernando and A. Dasanayake were promoted to Special Class and Class I of the Operative Grade, respectively, with effect from 1st January.

Mr. D. T. Mathes functioned as a Counterpart to the Agricultural Economist on a Project on Irrigating Coconut lands commissioned by the Ministry of Coconut Industries, and assisted in the preparation of the report "Irrigation of coconut in Sri Lanka – a pre-feasibility study."

2. BIOMETRICAL SERVICE:

The service provided assistance to the Research staff by way of statistical designs, selection of lands, lay out of experimental plots etc. for 38 experiments under 12 different disciplines identified in the new Five year Research Programme of the Institute. Analysis of data from the on-going experiments and assistance in interpretation of results was also provided.

3. RESEARCH PROJECTS

Project 19 – Applications of Biometry in Coconut Research.

Experiment 19.1 (BIO 1) : Calibration trial at Ratmalagara Estate, Madampe. (Intermediate Zone) – 1965

Bimonthly recordings of vegetative and yield characters of the palms in this experiment were carried out according to the schedule.

Variation of yield characters, within the six picks of 1984 and during the last five years are given in Tables 1 to 6.

Number of bunches per hectare.

Number of bunches for the first, second and third picks during the year 1984 shdowec a decline, compared with the previous years. The reduction over 1983 was 15.8%, 35.2% and 40.7% for the first, second and third picks respectively. However, an increase was shown for the fourth and sixth picks, recording an increase of 13.6% and 13.9% over the year 1983.

A reduction of 4.7% was indicated for the fifth pick compared with the same pick of 1983.

Table 1. *Number of bunches per hectare*

	1st pick	2nd pick	3rd pick	4th pick	5th pick	6th pick
1984	250	201	215	375	307	320
1983	297	310	362	330	322	281
1982	297	299	323	333	324	288
1981	280	339	331	305	298	303
1980	282	348	372	286	217	204

Table 2. *Number of nuts per hectare*

	1st pick	2nd pick	3rd pick	4th pick	5th pick	6th pick
1984	681	913	1162	1636	1004	858
1983	757	1258	2022	1917	1030	695
1982	1337	1621	1987	2243	1394	756
1981	988	1513	1700	1291	1273	1128
1980	1009	1017	1063	500	509	702

Table 3. *Number of nuts per bunch*

	1st pick	2nd pick	3rd pick	4th pick	5th pick	6th pick
1984	2.72	4.55	5.40	4.36	3.27	2.68
1983	2.55	4.07	5.59	5.80	3.20	2.47
1982	4.50	5.42	6.15	6.74	4.31	2.63
1981	3.52	4.46	5.14	4.24	4.28	3.72
1980	3.58	2.92	2.85	1.75	2.34	3.44

Table 4. *Number of nuts per palm*

	1st pick	2nd pick	3rd pick	4th pick	5th pick	6th pick
1984	4.25	5.71	7.26	10.23	6.27	5.36
1983	4.79	7.96	12.80	12.13	6.52	4.40
1982	8.46	10.25	12.57	14.19	8.82	4.78
1981	6.25	9.57	10.75	8.16	8.05	7.13
1980	6.38	6.43	6.72	3.16	3.22	4.44

Table 5. *Average weight per nut, copra outturn and copra yield over different picks of 1984.*

Pick	*Wt. per nut (gms.) **	*Copra outturn (nuts/candy)*	*Copra per hectare (kgs.) ***
1	444	1787	92.42
2	440	1804	124.93
3	465	1706	167.42
4	555	1429	285.71
5	701	1132	221.26
6	760	1044	202.47
Total/Ave.	562	1413	1094.21

* Weight per husked nut

** Coprra yield = weight x 0.32

Table 6. *Percentage increase/decrease in yield over the previous year.*

Year	*No. of bunches per hectare*	*No. of nuts per hectare*	*No. of Nuts per bunch*	*No. of nuts per palm*
1984	−12.3	−18.6	− 7.2	−18.6
1983	+ 2.0	−17.8	−19.4	−17.8
1982	+ 0.4	+18.3	+17.3	+18.4
1981	+ 8.6	+64.4	+51.2	+64.4

It is apparent that on the whole there was a reduction in the number of bunches per hectare during the first six months of the year and subsequently an increase was recorded during the second half of the year 1984 compared with the corresponding figures of 1983.

The overall reduction during 1984 was 12.3% over 1983

Number of nuts per hectare.

Number of nuts in 1984 showed a decrease over 1983 for the first five picks of the year. The percentages were 10.0%, 27.4%, 42.5%, 14.7% and 2.5%. However, an increase of 23.5% was recorded for the sixth pick. The overall decrease for 1984 was 18.6% when compared with the year 1983.

Number of nuts per bunch.

Except for the third and fourth picks the other four picks, indicated higher number of nuts per bunch in 1984 than in 1983. The percentage increase for the first, second, fifth and sixth picks was 6.7%, 11.8%, 2.2% and 2.5% respectively. The percentage decline recorded for the third and fourth picks was 3.6% and 24.8%. The overall drop in 1984 over that of 1983 was 7.2%.

Number of nuts per palm.

Except for the sixth pick the rest of the first, five picks showed a drop in 1984 compared with 1983. The respective percentages were 11.3%, 28.3%, 43.3%, 15.7% and 3.8%. The percentage increase for the 6th pick was 21.8% over 1983.

The total number of nuts for the year 1984 recorded a drop over 1983 with a percentage of 18.6%.

Average weight per nut, copra outturn and copra yield.

Average weight per nut showed a marked increase from the first pick to the sixth pick. The lowest recorded was, for the first and second picks while the highest, for the sixth pick. On the whole the first three picks of the year 1984 showed comparatively low weight per nut, against the weights for the second, three picks of the year. The average for the whole year was 562g per nut.

As could be expected, copra outturn showed a reverse pattern to that of weight per nut. The average number of nuts required for a candy of copra was around 1765 nuts for the first half of the year, while the comparative position for the second half of the year was around 1200 nuts per candy, thus indicating that the size of the nut/kernel had increased considerably during second half of the year. Average for the whole year was 1413 nuts per candy.

Copra yield per hectare showed a steady increase upto the fourth pick and thereafter a decrease was shown upto the sixth pick. However, on the whole copra yield per hectare for the second half of the year recorded an increase of 45.8% over that of the first half of the year.

The yield per hectare for the year was 1094 kg copra.

Experiment 19.2 (BIO 3) : Influence of excision of fruit bunches on female flower production in subsequent inflorescences (Ratmalagara Estate) – 1980.

The monthly recordings of this experiment were carried out during the year without any interruption. This experiment was concluded after the final recording in December 1984.

Experiment 19.3 (BIO 4) : Calibration trial at Walpita Estate – 1984.

Bimonthly recordings of vegetative and yield characters of the palms were carried out without interruption. The yield components over the six picks observed are as shown in Tables 7 and 8.

No. of bunches per palm.

Except for the fourth pick, rest of the five picks indicated a drop in number of bunches per palm in 1984 than was recorded in 1983. The percentages for the first, second, third, fifth and sixth picks were 5.7%, 37.9%, 9.5%, 31.3% and 61.1%, respectively. The increase recorded for the fourth pick was 11.8% over corresponding figure of 1983.

The overall drop in 1984 over 1983 was 23.7%.

Number of nuts per palm.

The number of nuts per palm during the first three picks of 1984 showed a drop compared with the corresponding pcks of 1983. However, a reversed situation was shown during the second half of the year. The percentage drop during the first half of the year was 42.5% and the increase during the second half of the year was 36.1%.

The overall yield recorded for 1984 showed a drop of 15.7% over the total for 1983.

Number of nuts per hectare.

A similar pattern was shown for number of nuts per hectare as was shown for the number of nuts per palm.

Number of nuts per bunch.

The number of nuts per bunch showed a similar pattern as for number of nuts per palm and number of nuts per hectare. The percentage decrease during the first three picks in 1984 was 50.0%, 33.8% and 15.5% respectively over that of 1983. While the three picks during the second half of the year showing an increase of 25.6%, 122.8% and 143.5% respectively.

4. YIELD RECORDING

Nine experiments having a total of 1937 palms were recorded at Bandirippuwa estate. One experiment each at Ratmalagara and Shantill estate was recorded. Total number of palms were 596. Total of 2636 palms in eight experiments were recorded at Pothukulama estate.

Table 7. *Average yield components over the six picks of 1983 and 1984.*

Components	*1st pick*		*2nd pick*		*3rd pick*		*4th pick*		*5th pick*		*6th pick*		*Total*	
	84	*83*	*84*	*83*	*84*	*83*	*84*	*83*	*84*	*83*	*84*	*83*	*84*	*83*
No. of bunches per palm	1.6	1.7	1.8	2.9	1.9	2.1	1.9	1.7	1.1	1.6	0.7	1.8	9.0	11.8
No. of nuts per plam	2.3	4.6	8.5	20.8	15.7	20.7	19.9	14.1	8.5	5.6	4.0	4.1	58.9	69.9
No. of nuts per hectare	362	725	1362	3283	2504	3275	3179	2223	1367	883	640	649	9414	11038
No. of nuts per bunch	1.4	2.8	4.7	7.1	8.2	9.7	10.3	8.2	7.8	3.5	5.6	2.3	6.5	5.9

Table 8. *Average weight per nut, copra outturn and copra yield over different picks of 1984.*

Pick	*Wt. per nut gms.*	*Copra outturn (nuts/candy)*	*Copra per hectare kgs.*
1	530	1499	60.73
2	695	1142	301.70
3	632	1257	462.72
4	592	1342	557.06
5	664	1195	232.19
6	805	986	158.72
Total/Ave.	640	1240	1773.11

The total number of nuts recorded for all the Research Divisions during the year was 181,871. In addition weight of the split nuts too was recorded for all the trials.

7. Agri-Meteorology:

The three meteorological stations at Bandirippuwa estate, Ratmalagara estate, and Isolated Seed Garden were maintained.

The recordings were taken daily throughout the year, morning and afternoon. The type of Met-recordings taken at the above stations were, rainfall, temperature (maximum and minimum), evaporation, humidity and soil temperature.

The data from these stations were provided to the Dept. of Meteorology monthly and number of outside Institutions on request.

5. WEATHER CONDITIONS DURING THE YEAR.

5.1.1 Bandirippuwa estate

a. Rainfall (mm.)

The total rainfall during the year was 1973.8 compared to 1472.6 in 1983 and 1788.6 the average total of the previous ten years. There had been a good distribution of rainfall during the year 1984 where every month experiencing rains. Except for August, all the other months have shown a rainfall of over 80. The breakdown rainfall during the first and second half of the year was 1288.3 and 685.5 respectively. The respective figures for 1983 was 680.2 and 792.4. The total rainfall and its distribution suggest that the year 1985 will be a good crop year compared to 1984 and 1983. (Table 9).

b. Temperature (^{o}C)

The average monthly maximum temperature during the year ranged from 30.1 to 32.0. The highest been for the months March and May. Lowest for the months August and December. The average for the year was 30.7.

The average minimum temperature ranged from 21.2 to 25.8. The highest been for the month of June and lowest for December. The average for the year was 23.8. (Table 10).

c. Evaporation (mean per day – mm.)

The lowest evaporation recorded was 2.7 for the month of November while the highest been for March with a value of 4.6. The average for the year was 3.6. Comparatively higher rate of evaporation was shown during the period April to September. (Table 10).

d. Soil temperature (^{o}C)

Soil temperature was recorded daily, morning and afternoon at depths ranging 5, 10, 20, 30, 60 and 120 cms.

Table 9. *Rainfall (mm.) for the last 10 years and during the year 1984. (Bandirippuwa Estate)*

Month	*1974*	*1975*	*1976*	*1977*	*1978*	*1979*	*1980*	*1981*	*1982*	*1983*	*Ave. 74-83*	*1984*
Jan.	0.0	4.8	8.1	0.0	0.0	0.5	0.0	50.8	0.0	0.0	6.4	197.9
Feb.	19.8	30.2	0.0;	99.8	3.0	146.8	0.0	66.0	0.0	0.0	36.6	106.9
Mar.	77.2	104.6	143.2	146.0	204.2	17.5	68.8	16.5	144.2	0.0	92.2	145.5
Apr.	329.9	386.6	119.6	131.6	145.8	70.9	206.0	100.6	125.2	219.7	183.6	425.2
May	270.8	319.0	56.9	700.0	590.0	174.5	54.2	333.5	232.9	322.1	305.4	297.7
June	103.1	178.8	60.2	130.6	64.0	231.4	308.1	107.4	328.4	138.4	165.0	115.1
July	183.4	202.7	51.8	14.2	1.3	22.4	21.8	38.6	152.1	79.7	76.8	111.0
Aug.	83.1	39.9	84.8	66.6	20.8	20.1	78.2	41.4	188.9	120.6	74.4	0.5
Sept.	208.3	152.9	80.8	74.7	84.1	194.8	182.3	124.2	185.2	242.1	152.9	129.3
Oct.	104.4	150.1	310.4	656.1	260.3	203.2	364.4	298.4	235.7	50.0	263.3	121.9
Nov.	148.3	466.6	522.5	322.3	455.9	364.5	184.9	297.2	244.6	159.0	316.6	239.8
Dec.	144.0	184.9	166.9	12.4	169.7	162.3	102.3	12.9	57.7	141.0	115.4	83.0
Total	1672.3	2221.1	1605.2	2354.3	1999.1	1608.9	1571.0	1487.5	1894.9	1472.6	1788.6	1973.8

Table 10. *Summary of meteorological observations during the year 1984. (Bandirippuwa Estate)*

Month	*Temperature*		*Mean per day*	*Relative humidity (%)*	
	Max.	*Min.*	*Evaporation (mm)*	*A.M.*	*P.M.*
Jan.	30.8	23.0	2.9	87	73
Feb.	31.2	23.1	3.2	87	73
Mar.	32.0	23.2	4.6	83	67
Apr.	31.6	24.3	3.6	85	78
May	32.0	25.4	3.5	82	75
June	30.5	25.8	4.0	81	77
July	29.5	25.0	3.4	85	82
Aug.	30.1	25.5	3.9	78	71
Sept.	30.5	24.3	4.5	77	71
Oct.	30.1	23.3	3.6	78	72
Nov.	30.6	22.2	2.7	82	78
Dec.	30.1	21.2	3.5	79	67
Ave.	30.7	23.8	3.6	82	74

The average morning temperature for the year for the above depths indicated values 28.9, 28.6, 29.7, 30.0, 31.0 and 31.0 respectively. While the respective values for the afternoon was 35.0, 33.3, 32.0, 30.8, 30.8 and 31.0. (Table 11).

5. 1.2 Ratmalagara estate.

Rainfall (mm.)

The total rainfall at Ratmalagara showed a higher value than at Bandirippuwa. The recorded rainfall was 2394.2. This was more than double the rainfall (1035.2) in 1983 for the station. The average total rainfall of 1527.2 for the previous ten years too indicated a lower rainfall. As at Bandirippuwa all the months had experienced rainfall indicating a good distribution throughout the year. The total rainfall for the first and second half of the year was 1492.8 and 901.4 respectively. The comparative figures for 1983 was 335.4 and 699.8. These figures indicate that this area too should show the year 1985 as a good crop year compared to 1984 and 1983. (Table 12).

5.13. Isolated Seed Garden (1 SG)

Rainfall (mm.)

Like for Bandirippuwa and Ratmalagara, ISG too indicated 1984 a good rainfall year for the area. The distribution of rainfall was well spread throughout the year with all the months experiencing good rains. The total rainfall for the year was 2389.1 compared to 1208.9 in 1983 and 1310.2, the average total of the previous ten years. As was shown for the two estates mentioned prior, ISG too showed higher rainfall during the first half compared to the second half of the year 1984. The comparative figures for the two periods were 1612.1 and 777 respectively. For the year 1983, it was 378.7 and 830.2. It is apparent that this area too indicating good crops during the year 1985. (Table 13).

It is interesting to note that the three stations mentioned before indicating comparatively higher rainfall during the first half against the second half of the year 1984. In addition a well spread rainfall over the year too was recorded. This spreading of rainfall over the year appears to be the situation in many areas of the country. This apparently suggest that the year 1985 would be a good crop year compared to 1984 and 1983 and even compared with the previous years.

6. PUBLICATIONS

6.1 Mathes, D.T. Effect of extraction of inflorescence sap and the removal of immature fruit bunches on the production of female flowers in coconut, *Cocos.* **2**

6.2 Mathes, D.T. "Crop weather relationships and its bearing on coconut production". (Presented at the first quarterly seminar of Coconut Research Institute).

6.3 Perera, U.V.H., Mathes, D.T. "Cost benefit analysis of irrigating coconut lands." (Presented at the seminar on consultation on irrigating coconut lands organised by the Ministry of Coconut Industries.)

Table 11. *Soil temperature at different depths. (Bandirippuwa Estate)*

	Morning						*Afternoon*					
Month	*5cm*	*10cm*	*20cm*	*30cm*	*60cm*	*120cm*	*5cm*	*10cm*	*20cm*	*30cm*	*60cm*	*120cm*
Jan.	26.9	27.2	28.1	28.2	29.5	29.9	32.3	31.3	30.7	29.3	29.5	29.9
Feb.	26.9	27.3	28.1	28.2	29.4	29.7	32.3	31.6	30.7	29.3	29.3	29.7
Mar.	29.1	29.5	30.6	30.8	31.9	31.4	38.4	34.9	33.8	32.3	31.7	31.4
Apr.	28.7	28.7	29.6	30.1	31.0	31.2	34.0	33.3	32.1	29.9	30.9	31.2
May	30.5	30.2	31.2	31.2	32.0	31.6	37.4	35.2	33.1	32.0	31.8	31.7
June	29.7	28.3	30.3	30.6	31.4	31.4	33.5	32.4	31.9	31.3	31.2	31.4
July	28.8	28.7	29.6	29.9	30.8	31.1	33.3	32.1	31.2	30.4	30.7	31.1
Aug.	30.4	30.3	31.8	32.0	32.6	32.1	39.3	34.9	33.0	32.5	32.4	32.1
Sept.	30.1	29.8	31.5	31.8	32.8	32.7	38.8	35.5	33.6	32.5	32.6	32.6
Oct.	29.6	28.6	29.4	29.8	31.0	31.1	34.9	33.9	32.1	30.8	30.8	31.1
Nov.	28.2	27.6	28.5	28.8	30.2	30.6	31.7	32.1	31.1	29.9	30.0	30.6
Dec.	27.6	27.1	27.8	28.4	29.6	29.8	34.5	32.7	31.3	29.6	29.3	29.8
Ave.	28.9	28.6	29.7	30.0	31.0	31.0	35.0	33.3	32.0	30.8	30.8	31.0

Table 12. *Rainfall (mm.) for the last 10 years and during the year 1984. (Ratmalagara Estate)*

Month	*1974*	*1975*	*1976*	*1977*	*1978*	*1979*	*1980*	*1981*	*1982*	*1983*	*74-83 Ave.*	*1984*
Jan.	0.0	14.0	18.3	1.0	0.0	0.0	0.0	78.7	0.0	0.0	11.2	132.9
Feb.	99.1	23.6	0.0	49.5	0.0	167.3	0.0	11.3	0.0	0.0	35.1	166.2
Mar.	13.7	142.7	139.7	186.7	89.3	16.9	16.7	38.4	118.8	0.0	76.3	168.6
Apr.	512.1	285.0	161.5	157.5	69.7	70.6	208.2	52.5	112.2	109.2	173.8	703.6
May	397.5	111.8	134.9	625.8	410.0	46.9	74.0	290.8	196.8	145.3	243.4	282.4
June	67.3	149.6	61.2	67.3	15.1	46.1	246.1	87.4	190.8	80.9	101.2	39.1
July	141.7	174.8	30.5	23.3	6.5	28.8	14.3	55.1	35.6	55.6	56.6	88.6
Aug.	105.9	17.5	30.2	35.4	27.5	46.1	31.2	80.4	155.2	74.9	60.4	2.0
Sept.	134.6	160.8	36.1	58.3	54.0	125.6	149.0	121.6	36.6	109.9	98.6	132.8
Oct.	57.2	221.2	215.1	565.9	302.0	316.3	239.6	168.9	272.8	79.5	243.9	109.3
Nov.	147.6	535.9	418.1	166.4	540.3	377.3	273.2	304.0	200.8	163.6	312.7	472.8
Dec.	53.3	84.3	114.6	73.8	55.7	272.6	126.4	24.2	118.7	216.3	114.0	95.9
Total	1730.0	1921.2	1360.2	2010.9	1570.1	1514.5	1378.7	1313.3	1438.3	1035.2	1527.2	2394.2

Table 13. *Rainfall (mm.) for the last 10 years and during the year 1984. (Isolated Seed Garden)*

Month	*1974*	*1975*	*1976*	*1977*	*1978*	*1979*	*1980*	*1981*	*1982*	*1983*	*Ave. 74-83*	*1984*
Jan.	0.0	24.4	10.9	0.0	0.0	13.1	0.5	36.9	0.0	0.0	8.6	96.9
Feb.	88.4	89.1	0.0	27.4	0.0	60.0	0.0	11.5	0.0	2.1	27.9	228.9
Mar.	17.0	170.4	112.3	168.7	23.3	17.6	23.7	93.5	176.3	1.6	80.4	279.7
Apr.	352.5	84.3	130.6	110.2	158.7	59.8	164.5	48.4	61.7	52.8	122.3	821.4
May	109.5	214.4	64.5	451.1	405.1	11.4	87.8	147.8	281.8	248.8	202.2	155.5
June	40.1	80.0	18.8	21.6	11.1	34.8	147.9	148.9	110.7	73.4	68.7	29.7
July	104.9	127.0	9.1	25.0	16.4	19.4	5.8	72.5	32.1	26.4	43.9	117.0
Aug.	17.3	6.3	16.0	19.7	10.1	10.6	10.0	54.3	91.6	78.0	31.4	3.8
Sept.	76.2	79.0	10.7	31.7	32.9	197.8	106.9	68.4	35.6	89.4	72.9	164.7
Oct.	34.8	64.8	205.2	759.9	521.6	160.6	272.1	280.3	199.9	105.7	260.5	227.3
Nov.	94.2	339.9	271.3	247.2	582.9	356.6	251.0	295.9	152.7	199.3	279.1	210.6
Dec.	53.4	94.2	108.2	34.0	97.6	172.1	82.7	54.3	93.4	331.4	112.3	53.6
Total	990.3	1373.8	957.6	1896.5	1859.7	1113.8	1152.9	1312.7	1235.8	1208.9	1310.2	2389.1

4.4 Ibrahim, M.N.M., Thilakasiri, M.A. and Mathes, D.T. Utilization of Fibrous Agricultural Residues in Integrated Crop-livestock Farming Systems in Sri Lanka. (Proceedings of the third annual workshop of the Australian-Asian Fibrous Agricultural Residues Research Network).

Lectures:

i. Lectures were given to two batches who followed the Diploma in Plantation Management Course, conducted by National Institute of Plantation Management.

ii. Lectures were also given to two batches of Coconut Development Officers of the Coconut Cultivation Board.

REPORT OF THE BOTANY UNIT

Officer-in-Charge – R. Mahindapala, Ph.D

GENERAL

The staff position remained unchanged. Mrs. C. W. Jayasekera continued her post-graduate studies at the University of Queensland, Australia.

The conditions of the Tissue Culture laboratory were improved. The inoculation and incubation areas were air-conditioned. The incubation area was also provided with additional lights. Several items of equipment, including a plant growth chamber, were procured during the year. An annex, containing store rooms and a toilet, was added to the main laboratory.

The United States Agency for International Development (USAID) awarded a research grant worth Rs. 2,871,806/= for work on "Culture of leaf explants of coconut *in vitro*". The award is for four years, commencing 16 October, 1984, and will be administered by the Natural Resources, Energy and Science Authority of Sri Lanka.

RESEARCH PROJECTS

PROJECT 16 – Studies on the physiology of the coconut palm

Experiment 16.1 A study of drought tolerance in relation to stomatal density and behaviour.

A comparative study of early growth of seedlings of *var* Tall x Tall (T x T), Dwarf Yellow x Tall (DY x T) and Dwarf Green x Tall (DG x T) and the effect of water stress on their stomatal properties was carried out. The experiment used a fully randomized design with six single seedling replicates.

Seedlings were transferred from the nursery at seven months to large plastic pots containing sandy loam soils, where they were raised in the glass house (at 30 - 35°C). Each pot received 70 g of a fertilizer mixture containing ammonium sulphate (3 parts), Muriate of Potash (2 parts), Super Phosphate (1 part) and Kieserite (1 part). All pots except one set were irrigated frequently. The unirrigated pots were subjected to water stress, which will be studied later. Seedlings were harvested at three-month intervals and their dry weight recorded.

Results: The number of stomata per unit area did not show any significant difference among the three cultivars (Table 1). Except for harvest 1, the dry weight did not differ significantly. At harvest 1, DY x T had a significantly higher dry weight than the other two cultivars. Between T x T and DG x T the former had a slightly higher dry weight.

Table 1. *Stomata per unit area, dry weights, length of primary roots and root dry weight of T x T, DY x T and DG x T cultivars.* *

Parameter	*T x T*	*DY x T*	*DG x T*
Stomata per unit area	45.1 a	49.7 a	45.1 a
Total dry weight (g) at			
harvest 1	43.2 a	52.5 a	39.2 c
harvest 2	98.6 a	106.6 a	97.6 a
harvest 3	133.5 a	166.3 a	148.5 a
Total length (cm) of primary roots at			
harvest 2	151.1 b	248.6 a	168.2 b
harvest 3	310.5 a	285.4 ab	243.8 b
Root dry weight (g) at			
harvest 2	5.5 c	12.8 a	8.2 b
harvest 3	17.0 a	24.16 a	18.5 a

* Values followed by the same letter do not significantly differ at p = 0.05.

The cultivar DY x T had longer primary roots (248.6 cm) at harvest 2 which was significantly higher than that of the other two cultivars, while at harvest 3, T x T had longer primary roots than DY x T, though not significantly different. The roots of DG x T at harvest 3 were shorter than the other two cultivars. At harvest 3, the dry weight of roots of T x T was less than that of the other cultivars inspite of being longer. It appears that cultivar T x T produced much narrower roots which character could be more favourable to withstand drought conditions as there is more root surface for moisture absorption.

Data on growth parameters are presented in Table 2. A very slight difference in the relative growth rate (RGR) between the cultivars from harvest 2 - 1 was noted, but both DG x T and DY x T showed slight increase between harvest 3 - 2. This could possibly be a sign of hybrid vigour of the DG x T and DY x T hybrids compared with T x T.

Table 2. *Relative Growth Rate (RGR) mean leaf Weight Ration (LWR) shoot to root ratio of T x T, DY x T, and DG x T seedlings.*

RGR ($g\,g^{-1}\,week^{-1}$)	*T x T*	*DY x T*	*DG x T*
harvest 2 - 1	0.061	0.055	0.072
harvest 3 - 2	0.024	0.038	0.032
Mean LWR (gg^{-1})			
Harvest 2 - 1	6.510	0.445	0.515
Harvest 3 - 2	0.445	0.405	0.480
Shoot/root			
at harvest 2	19.33	7.675	11.80
at harvest 3	7.23	6.02	7.75

No significant difference was observed in the leaf weight ratio of DG x T and T x T while that of DY x T was slightly less than that of the other two cultivars. These values indicate that DG x T and T x T had relatively higher leaf weight per unit dry weight. The values of shoot to root ratio showed that at harvest 2, DY x T had relatively higher dry matter partitioned to root compared with the shoot. These values decreased by harvest 3 and the differences between cultivars were insignificant.

V. U. de S. Jayasuriya

Experiment 16.2 – To study the physiological effects of chlorine on young seedlings.

Tall x Tall seedlings were raised in nutrient solutions in 20 litre plastic buckets at 4 levels of chlorine; 0, 1, 2 and 3 ppm. The nutrient solution used was modified Hoaglands as given below:

Chemical	*Vol. of 1M solution per litre of final soln.*
KNO_3	6 ml
$Ca(NO_3)\ 4H_2O$	4 ml
$NH_4H_2PO_4$	2 ml
$MgSO_47H_20$	1 ml

Micronutrients : (g/l) 1ml diluted to 1 l

KC1	0/2.106/4.210/6.318	giving 0, 1, 2 and 3 ppm
H_3BO_3	1.546	
$MnSO_4\ H_20$	0.338	
$ZnAO_47H_20$	0.575	
$CuSO_45H_20$	0.125	
H_2Mo0_4	0.081	
Fe EDTA	6.922	

Seedlings have been growing in the above nutrient solution for about 5 months. They will be transferred to pots when they are about 9 to 10 months. Studies on stomatal density showed no significant differences between the treatments with a density ranging from 43.8 to 47.6 stomata per unit field. No differences were observed in stomatal resistance and the rate of transpiration, the measurements being done while the plants were growing in the nutrient medium. Effect of drought on stomatal movement after different treatments will be monitored once the plants are transferred to pots.

V. U. de S. Jayasuriya

FIELD STUDIES

Project 17 – Studies on premature decline of palms.

Experiment 17.1 : Survey of tapering palms in the coconut triangle.

The survey of tapering palms was concluded at the end of 1984 and nearly 18,000 acres of coconut land came under the study, which included both small and large holdings. Representative blocks were selected from these lands, and the number of tapering palms recorded. Tables 3 and 4 give the details of the survey and the incidence of tapering.

The results indicate that the incidence of tapering in the Puttalam District to be higher (1.61%) than Kalutara and Colombo districts (1.35%). The lowest incidence was observed in Kurunegala (0.60%). When the entire coconut triangle is considered, the overall incidence of tapering is low (0.89%).

It is possible that dry spells or low rain fall could be one of the factors that contribute to tapering resulting in weak palms. The rainfall data for a period of 10 years from 1973 show that Puttalam had a comparatively low rainfall compared with the other districts (Table 5). It is evident from the rainfall data that Kurunegala had about 76% more rainfall than Puttalam, and Gampaha and Kalutara districts received nearly double the amount of rainfall received in Puttalam.

From the data collected, it was possible to study the incidence of tapering under different soil fertility conditions, irrespective of the district. Table 6 shows the incidence of tapering under different conditions of fertilization. It is evident from these results that the highest incidence of tapering was observed in lands where no fertilizer was used. The incidence of tapering palms was low in lands regularly fertilized with inorganic fertilizer and this was still lower when organic fertilizers are also used in addition to inorganic fertilizer.

V. U. de S. Jayasuriya

Table 3. *Acreage distribution of the survey.*

District	*Coconut Plantations*		*Total (ac)*
	Less than 25 ac	*more than 25 ac*	
Kalutara/Colombo	05	11	600
Gampaha	36	52	4414
Puttalam	21	32	5742
Kurunegala	11	41	7368

Table 4. *Incidence of tapering.*

District	*Total No. of palms*	*No. of tapering palms*	%
Kalutara & Colombo	7,473	101	1.35
Gampaha	65,565	440	0.67
Puttalam	54,964	883	1.61
Kurunegala	99,094	598	0.60
Total	227,096	2,022	0.89

Table 5. *Average rain fall (mm) for a period of 10 years from 1973.*

Year	*Puttalam District*	*Kurunegala District*	*Gampaha District*	*Kalutara District*
1973	1250	1458	2127	3243
1974	720	1849	2555	3533
1975	1066	2002	2827	2850
1976	883	1620	1646	2633
1977	1478	2317	2895	2883
1978	1499	2333	2248	2328
1979	1061	1868	2410	2119
1980	1023	1551	1969	1697
1981	1102	1913	2383	2214
1982	963	2587	2014	2107
Average	1105	1950	2307	2534

Table 6. *Fertilizer usage and the incidence of tapering.*

	Inorganic fertilizer only (3 kg/palm or more)	*Inorganic (3 kg/palm and cattle dung or other forms of organic manure*	*irregular* application*	*no fertilizer*
Incidence of (%) tapering	0.84	0.67	1.49	2.18

* either less than 3 kg/year or not fertilized regularly.

Project 18 – Studies on the vegetative propagation of coconut.

Experiment 18.1 : In vitro culture of embryos of local varieties of coconut.

Coconut seedlings have been produced *in vitro* from excised embryos of the three colour forms of the dwarf variety, *nana*, using the technique developed earlier. These were then used to carry out investigations on establishment in soil. Seedlings were transplanted in pre-sterilized soil/vermiculite mixture and incubated under humid conditions at the laboratory temperature (30 - 34^{o}C). These seedlings lived in soil/vermiculite for about 4 weeks only.

Embryos obtainef from CRIC 65 have also been cultured to produce plants. About 58% of the embryos cultured germinated in culture. This work will be continued.

Experiment 18.2 : Effect of growth hormones on the formation of vegetative propagules on inflorescence shoot.

In this experiment, four hormones (Gibberelin, Auxin, Cytokinin, Ethrel, and water as control) are used at three concentrations (100 ug, 300 ug and 500 ug) in four application sites (trunk, rachis, tender leaf and inflorescence) in 4 x 3 x 4 factorial design. Since March 1983, six hormone applications have been carried out, each three months apart. As no visible changes in vegetative growth were observed in the treated palms, the concentrations of the hormones have been doubled since September, 1984. Data on button nut counts and pollen viability were collected. The experiment is in progress.

S.M. Karunaratne

Experiment 18.3 : Growth and callus formation in excised shoot apex, leaf and inflorescence explants of coconut.

It has not been possible to achieve significant progress in the culture of shoot apical issues of coconut. A medium which induces callusing and subsequent rooting in tender leaf explants of coconut has been developed. About 30% of the cultured leaf explants produced callus/root in this medium. Further experiments are in progress to identify the 'critical' ingredeint(s) in this medium in order to further refine it and to induce shoot formation.

Experiments on culture of male flowers/anthers commenced in 1984. Callus formation was observed in the anther wall tissues. The microspores of these anthers were observed to be viable (as evidenced by plasmolysis at high concentrations of sucrose solutions) but did not germinate in the germinating medium. Further investigations to induce embryogenesis in the haploid tissues of the anthers are in progress.

S.M. Karunaratne

REPORT OF THE PUBLICATIONS, DOCUMENTATION AND LIBRARY UNIT

Officer-in-charge – P.A. Henry Nimal Appuhamy Bsc Agric

1. General

The Publications/Publicity Officer continued to be on no pay leave abroad. Mr. J.H.P. Chandradasa, Office Attendant left the Island on one year's no pay leave on 5 September 1984. Miss. B. Sulosana, Clerk Typist cum Proof Reader (Tamil), vacated her post with effect from 30 April 1984. This year too, the Library and the Coconut Information Centre, set up as a project of the International Development Research Centre, Canada, functioned together. The Unit continued to provide Clerical and Secretarial assistance to the Extension Officer.

2. Publications

Extension Publications

Extension Publications

The Editorial Board for extension publications of the Institute was reconstructed as follows.

Dr. R. Mahindapala, Deputy Director (Research), Coconut Research Institute (Chairman)
Mr. S.M.P. Subasinghe, Extension Officer, Coconut Research Institute
Mr. P.A. Henry Nimal Appuhamy, Assistant Publications/Publicity Officer, Coconut Research Institute.
Mr. K. Karunanayaka, Deputyt General Manager, Coconut Cultivation Board.
Mr. W. Wickramasinghe, Assistant Regional Manager, Coconut Cultivation Board.

The Editorial Committtee decided to issue Pol Pawath and its translations twice a year, with a main theme for each issue. The following issues were published in June, on the theme "Drought".

Pol Pawath (Sinhala) Vol. 7 No. 3
Coconut Bulletin (English) Vol. 1 No. 1
Tennait Takaval (Tamil) Vol. 2 No. 1

In order to further improve the quality of these journals, it was decided to print them, in future, by Offset Printing Process with colourful cover pages. The second issue for the year, organized in the new format was issued in December in two languages on the theme "Crop Protection".

Pol Pawath (Sinhala) Vol. 7 No. 4
Coconut Bulletin (English) Vol. 1 No. 2

The absence of a Tamil assistant in the Unit, caused delay in publication of *Tennait Takaval* Vol. 2 No. 2.

In spite of high printing cost, *Pol Pawath*, *Coconut Bulletin* and *Tennait Takaval* were sold at the subsidised prices Of Rs. 2/=, Rs. 5/= and Rs. 2/= respectively. The popular journal *Pol Pawath* was distributed free of charge to extension personnel of the Coconut Cultivation Board, JEDB Estates, Farm Schools, Members of Parliament, Members of the Directorate of the Coconut Development Authority and Coconut Cultivation Board, Ministries of Agriculture and Plantation Industries, District Agricultural Extension Officers, University Libraries, Tea, Rubber and Sugarcane Research Institutes, Minor Export Crops Department and Public Libraries.

Handbook

The Handbook on Coconut Cultivation, edited by the former Director of the Institute, Dr. U. Pethiyagoda, was published during the year. This book gives comprehensive coverage on cultivation, fertilizer and manures, pests and their control and intercropping.

Advisory Leaflets

In order to maintain the stocks of Advisory Leaflets for uninterrupted distribution, leaflets on 17 topics were reprinted during the year.

It was decided to update the advisory leaflets incorporating the new recommendations of the Institute. A new set of advisory leaflet titles was drawn up, and action was taken to prepare them. The leaflets will be categorized into different subject areas. This work is expected to be completed by the end of the year.

During the year a large number of advisory leaflets was distributed free of charge mainly among the farmers, students and the extension personnel of the Coconut Cultivation Board on their requests.

Advertisements

In order to popularise the journals and books published by the CRI two advertisements were printed and sent to all relevant personnel, Institutions and Organisations all over the world.

P.A. Henry Nimal Appuhamy

3. Library

During the year 102 books were acquired, 67 journals were received on subscription and 140 on exchange.

Thirty items were loaned to other libraries and 18 were received under inter-library loan agreement.

Under the Agricultural Information Network (AGRINET) scheme 15 contents pages from journals were received for the CRI scientists and 60 were supplied by this library to other organizations.

From the British Library Lending Division, 50 items were supplied to the scientists in the Institute.

Scientists of the Institute were alerted for 48 items received in the library relevant to their interests during the year.

During the year 40 students from various Universities and Technical Colleges used the library facilities.

M. J. C. Perera, Librarian

4. Photography

A film on the progress of the coconut rehabilitation work in the Eastern Province was made. In collaboration with the Sri Lanka Rupavahini Corporation, two video films on "Efficient use of kernel in domestic consumption" and "Proper management practices for coconut" were produced. These were telecast on Repavahini.

During the year, nine film shows were given on requests by various societies and organisations and 17 slide shows were organised at seminars and training programmes conducted by the Institute.

Transparencies and photographs required by the divisions (1351 photographs and 320 slides) were prepared.

D. B. Hettiarachchi

5. Museum and Graphic Work

The Museum was maintained satisfactoraly. All line drawings and other graphic work required for the publications and Divisions were prepared by the Artist. A greetings card was also designed.

D. W. Hapuarachchi, Artist

6. Exhibition

The Institute participated in the "Gam Udawa - 1984" exhibition at Anuradhapura.

7. Visitors

During the year 1871 persons visited the Institute, of which 1786 were students and teachers from 19 schools.

8. Miscellaneous

A press conference was organised to popularize efficient methods of using coconut kernel for curry making. A demonstration on the methods was also organised.

A Field Day for small holders in the Puttalam District was organised by the Institute at the Isolated Seed Garden, Ambakelle and the assistance of the Unit was provided in organization of this event.

REPORT OF THE ESTATES MANAGEMENT DIVISION

Head - P.S. Liyanagama B.Sc. Agric (Cey)

The following coconut estates, seed gardens, nurseries and a dairy were administered by this Division.

1. Badirippuwa Estate.
2. Rathmalagara Estate.
3. Poththukulama Estate.
4. Kirimetiyana Estate.
5. Walpita Estate.
6. Makandura Seed Garden.
7. Maduru Oya Seed Garden.
8. Rathmalagara Nursery.
9. Wijerama Nursery.
10. Bandirippuwa Nursery. (for research purposes)
11. Bandirippuwa Dairy.

The total extent of these amounts upto 1310 acres out of which 985 acres come under estates. Of this, 40 acres (20 ac. in Bandirippuwa Estate, 17 ac. in Rathmalagara Estate and 3 acres in Poththukulama Estate) had been underplanted and 395 vacancies had been filled with CRIC-60 seedlings during this period. Recommended soil and moisture conservation measures such as contour draining and cover cropping were practiced in these estates and a total of 1919 husk pits were completed by end of the year.

Well distributed rain fall experienced throughout the year had been very favourable for the plantations. However this had posed a problem in controlling weeds. Nontheless, satisfactory ground conditions were maintained.

General performance of the estates had been quite satisfactory excepting that of Kirimetiyana Estate, where no development work had been done on account of the uncertainity of its ownership.

Of the three nurseries, Wijerama Nursery in Colombo was handed over to the Coconut Cultivation Board on 84.11.01. The nursery at Rathmalagara Estate was closed down by end of the year.

In addition to Makandura Seed Garden, preliminary work to establish another Seed Garden in System 'B' of Mahaweli Project was commenced.

(A) BANDIRIPPUWA ESTATE, LUNUWILA.

Area Statement.

(a)	*Block*	*Hectares*	*A.*	*R.*	*P.*
	1	61.92	153	0	00
	2-A	47.85	118	0	38
	2-B	24.24	59	3	26
	2-C	12.06	29	3	07
	Total :	146.07	360	3	31
(b)	Coconut	134.81	333	0	17
	Buildings etc.	11.27	27	3	14
	Total :	146.07	360	3	31

(c) Distribution of planted area.

Block No.	*Field No.*	*Hectares*	*A.*	*R.*	*P.*
1	1	11.74	29	0	00
1	2	5.67	14	0	00
1	3	9.31	23	0	00
1	4	17.04	42	0	17
1	5	8.90	22	0	00
1	6	3.24	8	0	00
2-A	7	46.94	116	0	00
2-B	8	20.23	50	0	00
2-C	9	11.74	29	0	00
	Total	134.81	333	0	17

Census of palms.

Field	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*Total*
Bearing:	1297	122	995	1606	761	349	4803	2486	1657	14076
In flower:	-	-	-	-	-	-	152	-	-	152
Established:	-	-	-	-	-	-	577	32	-	609
Seedlings:	673	481	-	46	29	49	1637	1636	119	4670
Duds:	2	-	20	21	1	-	100	33	24	201
Vacancies:	249	33	310	645	314	175	1208	813	356	4103
Total:	2221	636	1325	2318	1105	573	8477	5000	2156	23811

Crop records.

(a)

Pick	*1979*	*1980*	*1981*	*1982*	*1983*	*Five Years' Average*	*Per Cent*	*1984*
1	99,957	83,066	69,654	63,330	75,157	78,233	14.2	31,107
2	150,166	87,271	139,433	86,138	126,571	117,916	21.5	57,418
3	149,830	117,550	139,805	117,120	141,571	133,175	24.3	96,823
4	105,428	105,820	105,157	109,202	100,693	105,260	19.2	112,174
5	54,710	51,977	73,577	63,571	56,482	60,063	10.9	62,678
6	74,902	43,458	64,675	53,853	33,878	54,153	9.9	37,766
Total :	634,993	489,142	592,301	493,214	534,352	548,800	100.0	397,966

(b) *Average Yield*	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*
Nuts/ha/yr	4704	3623	4387	3653	3958	2952
Nuts/ac/yr	1907	1469	1779	1481	1605	1195
Nuts/palm/yr	42.2	31.3	41.6	34.1	38.0	28.3

Total yield for 1984 indicates a decrease of 25.5% over the previous year's yield.

4. **Disposal of Crops**: (Upto the 4th crop only)

	Nuts	*Percent*
Sold to dealers	178,024	59.8
Converted into copra	28,488	9.6
Gratis to resident staff	29,311	9.9
Issues to Research Divisions	62	0.0
Issues to C.C.B.	521	0.2
Exported as seed nuts	45,000	15.1
Lost	292	0.1
Empties & rejections	15,824	5.3
	297,522	100.0

5. **Copra** (Upto the fourth crop only)

	Weight (Kg)	*Percent*
Grade 1	3494	81.4
Grade 2	521	12.2
Grade 3	276	6.4
	4291	100.0

No. of nuts converted into Copra	=	28,488
Copra out-turn	=	663.9 nuts/100 kg.
	=	1690 nuts/Candy.

Only the buyer's rejections and nuts from experimental plots were converted into copra and hence the poor out-turn.

General Remarks :

Progress in field operations at Bandirippuwa Estate was seriously affected due to suspension of contract work system on account of certain alegations and disruptions. This was further aggravated by lack of staff and labour. Two Superintendents had to leave Bandirippuwa on account of these disturbances.

However, towards the latter part of the year most of the problems were resolved and a satisfactory progress was shown in field operations. Weeds were effectively controlled and 17acres (1313 seedlings) were underplanted with CRIC -60. The estate embarked on an extensive husk burrying programme and completed 319 pits by the end of the year. Removal of duds and old stands too was commenced, completing 268 palms by the year end. These operations will be continued as scheduled in the following year.

(B) POTHTHUKULAMA ESTATE, PALLAMA.

1. Area Statement.

		Hectares	*A.*	*R.*	*P.*
Coconut	–	57.81	142	3	17
Paddy	–	1.80	4	1	31
Banana	–	0.46	1	0	22
Forest etc.	–	25.76	63	2	24
		85.83	212	0	14

2. Census of palms.

Bearing	–	7045
Young palms	–	878
Seedlings	–	300
Duds	–	344
Vacancies	–	1086
		9653

3. **Crop records.**

(a)

Pick	*1979*	*1980*	*1981*	*1982*	*1983*	*Five Years Average*	*Per cent*	*1984*
1	70,835	53,944	76,127	72,480	55,206	65,719	12.9	22,959
2	118,303	57,003	104,609	102,292	82,862	93,014	18.3	23,519
3	106,881	52,417	88,790	128,741	200,907	115,547	22.8	40,842
4	71,027	43,892	96,614	133,618	113,825	91,796	18.1	61,673
5	61,807	73,586	82,909	89,778	81,727	77,962	15.3	56,197
6	48,875	64,157	92,874	68,013	46,724	64,129	12.6	61,156
	477,728	344,999	541,923	594,922	581,251	508,167	100.0	266,346

(b)

Average yield	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*
Nuts/ha/yr	–	5,968	9,374	10,291	10,055	4,607
Nuts/ac/yr	–	2,413	3,790	4,160	4,065	1,863
Nuts/palm/yr	–	43.7	75.4	82.4	80.7	37.8

Percentage drop in yield = 54.2%

4. **Disposal of Crops** (upto the 5th pick only)

	Nuts	*Percent*
Sold to dealers	102,461	50.0
Converted into copra	79,908	38.9
Gratis to resident staff	4,088	2.0
Issues to Research Divisions	590	0.3
Empties and rejections	18,143	8.8
	205,190	100.0

General Remarks

The entire estate was maintained in a very satisfactory condition. Weeds were effectively kept under control and the plantation was regularly mulched with fallen fronds etc. Drainage canals and contour drains were deepened and desilted for better soil and water management. Husk burrying was done in "40 acre" block and 468 pits were completed by the end of the year.

Manuring was done as scheduled. The boundary fence was maintained in good order. All the roadways i.e. the access road from the main road, internal roads and boundary paths were weeded, resurfaced with gravel and maintained satisfactorily.

A vacant patch in field No. 9 was planted with 250 seedlings of CRIC-60 and another 50 vacancies in other fields were filled with the same variety of seedlings from Ambakelle.

(C) RATHMALAGARA ESTATE, MADAMPE.

1. Area Statement.

	Hectares	*A.*	*R.*	*P.*
Coconut	97.13	240	0	00
Nursery	3.64	9	0	00
Roads and Buildings	2.02	5	0	00
Wasteland	7.69	19	0	00
Total	110.48	273	0	00

2. **Census of palms.**

Field :	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*Total*
Seedlings	1,600	-	-	-	-	-	-	275	-	1,875
Young palms	-	-	-	2,065	500	250	-	4	-	2,819
Bearings	1,439	365	546	1,298	978	1,645	2,715	444	547	9,977
Duds	48	12	35	51	42	25	58	19	10	300
Vacancies	132	41	79	364	184	710	125	17	194	1,846
Total	3,219	418	660	3,778	1,704	2,630	2,898	759	751	16,817

3. **Crop records.**

(a)

Pick	*1979*	*1980*	*1981*	*1982*	*1983*	*Five years Average*	*Per cent*	*1984*
1	70,522	54,144	92,803	97,458	60,175	75,014	11.3	43,324
2	88,362	78,827	122,889	143,151	133,010	113,248	17.0	80,520
3	160,199	92,213	148,786	143,880	169,948	143,205	21.5	138,295
4	143,041	84,513	153,030	154,895	196,896	146,475	22.0	119,035
5	86,422	66,913	140,566	142,485	108,141	108,906	16.4	121,802
6	56,902	64,232	121,302	77,401	72,455	78,459	11.8	72,417
Total	605,448	441,842	779,376	759,270	740,625	665,307	100.0	575,393

(b)

Average Yield	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*
Nuts/ha/yr	6,231	4,547	8,021	7,814	7,622	5,924
Nuts/ac/yr	2,522	1,841	3,247	3,163	3,086	2,398
Nuts/palm/yr	51.1	37.3	68.3	66.4	71.6	57.6

Drop in total yield = 22.3%.

4. **Disposal of crops** (Upto the 5th crop only)

	Nuts	*Percent*
Sold to dealers	392,317	78.0
Converted into copra	50,907	10.1
Gratis to resident staff	10,227	2.0
Issues to Research Divisions	3,935	0.8
Seed nuts	13,550	2.7
Rejections	32,040	6.4
Total	502,976	100.0

5. **Copra** (Upto the 5th crop only)

	Weight (Kg)	*Percent*
Grade 1	6,686	99.2
Grade 2	53	0.8
Grade 3	-	-
	6,739	100.0

Copra out-turn: 755 nuts/100 kg (1926 nuts/candy). Poor out-turn is due to higher percentage of dwarf palm nuts and buyer's rejections.

General Remarks.

Well distributed rain fall experienced throughout the year was most conducive for heavy weed growth. However they were kept satisfactorily under control. Manuring of old and young plantations was done as scheduled. Fences and roadway were maintained satisfactorily. Drains were desilted and maintained in good order.

Twenty acres in Field No. 1 was underplanted with 1600 seedlings of CRIC-60 on 25' triangular system. Another 60 vacancies were supplied in the underplantations.

(D) WALPITA ESTATE, KOTADENIYAWA.

1. Area Statement.

(a)

Block	*Hectares*	*A.*	*R.*	*P.*
A	9.71	24	0	00
B	8.10	20	0	00
Total	17.81	44	0	00

(b)

	Hectares	*A.*	*R.*	*P.*
Coconut	17.00	42	0	00
Building etc.	0.81	2	0	00
	17.81	44	0	00

(c)

Distribution of planted area.

Block	*Hectares*	*A.*	*R.*	*P.*
A	8.90	22	0	00
B	8.10	20	0	00
Total	17.00	42	0	00

2. **Census of palms.**

	Block A	*Block B*	*Total*
Seedlings	220	111	331
Bearing palms	1202	926	2128
Duds	45	31	76
Vacancies	10	9	19
Total	1477	1077	2554

3; **Crop records.**

(a)

Pick	*1979*	*1980*	*1981*	*1982*	*1983*	*Five Year's Average*	*Per Cent*	*1984*
1	10,925	11,039	6,145	16,139	9,809	10,811	7.8	5,408
2	24,867	21,543	14,658	33,757	28,955	24,756	18.0	11,032
3	31,018	27,296	39,887	41,421	36,014	35,127	25.5	24,040
4.	35,621	20,977	45,877	42,655	30,775	35,181	25.5	33,704
5	18,479	15,378	22,632	31,349	17,887	21,145	15.3	25,854
6	10,934	7,021	16,756	11,964	7,627	10,860	7.9	8,623
Total	131,844	103,254	145,955	177,285	131,067	137,880	100.0	108,661

(b)

Average yield	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*
Nuts/ha/yr	7,756	6,074	8,586	10,429	7,710	6,392
Nuts/ac/yr	3,139	2,458	3,475	4,221	3,121	2,587
Nuts/palm/yr	—	—	—	79.6	60.6	51.1

Total yield for 1984 indicates a drop of 17.1% over the previous year's yield.

4. **Disposal of Crops** (Upto the 5th pick only)

	Nuts	*Percent*
Sold to dealers	84,957	85.0
Gratis to Staff	1,400	1.4
Converted into Copra	9,644	9.6
Rejections	4,037	4.0
Total	100,038	100.0

5. **Disposal of Copra** (Upto the 5th pick only)

	Weight (Kg)	*Percent*
Grade 1	748	57.8
Grade 2	350	27.0
Grade 3	197	15.2
Total	1295	100.0

General Remarks.

The Estate was maintained in a satisfactory condition. Weeds were kept under control and the palms were mulched regularly with fallen fronds etc. Roads and fences were maintained in good order. Husk burying was commenced in a systematic cycle to complete the entire estate in four years. Manuring was done as per recommendations.

(E) KIRIMETIYANA ESTATE, LUNUWILA.

1. **Area Statement.**

	Hectares	*A.*	*R.*	*P.*
Coconut	32.38	80	00	00
Buildings, waste land etc.	6.23	15	01	25
	38.61	95	01	25

2. **Census of palms..**

Seedlings	260
In flower	1150
Bearings	775
Duds	475
Vacancies	2460
	5120

3. (a)

Crop Records.

Pick	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*
1	40,744	34,953	11,827	1,856	3,914	1,751
2	60,880	40,123	17,672	2,971	5,720	3,318
3	46,312	30,849	20,527	2,430	4,866	4,240
4	22,896	18,033	25,424	2,792	3,693	3,514
5	22,721	12,242	3,272	2,156	3,227	1,861
6	17,624	8,166	2,202	1,744	1,364	1,854
Total	211,177	144,366	80,924	13,949	22,784	16,538

(b)

Average yield	*1982*	*1983*	*1984*
Nuts/ha/yr.	345	563	513
Nuts/ac/yr.	140	228	208
Nuts/palm/yr.	21.5	35.1	21.4

4. **Disposal of Crops** (Upto the 5th pick only)

	Nuts	*Percent*
Sold to dealers	9,764	66.5
Gratis to resident staff	3,318	22.6
Rejections	1,230	8.4
Lost	372	2.5
Total	14,684	100.0

General Remarks:

No development work was done in this estate on account of the uncertainity of ownership. Arrangements are now finalised to purchase this land outright from the Land Reform Commission.

Report on Nurseries.

(a) Seedlings Issued.

A total of 80,141 seedlings were issued during the year 1984 and the break-down of the same is given below.

Name of the Nursery	*Plus palm (Ordinary)*	*Tall x Tall*	*Dwarf x Tall (Hybrid)*	*King Coconuts*	*Dwarf Red*	*Dwarf Yellow*	*Total*
Bandirippuwa	5,955	14,259	7,122	812	1,072	304	29,524
Rathmalagara	38,694	3,880	1,921	–	–	–	44,495
Wijerama	135	1,709	4,278	–	–	–	6,122
Total	44,784	19,848	13,321	812	1,072	304	80,141

General Remarks.

The Wijerama Nursery in Colombo was handed over to the Coconut Cultivation Board on 84.11.01 and the Rathmalagara Nursery was closed down from 84.12.31. Only Bandirippuwa Nursery will remain as a research nursery to accommodate nursery trials.

Report on Bandirippuwa Dairy.

1. **Total milk Production :** 47,200½ pints.

2. **Disposal of milk.**

(a)	Sold to staff	–	34,277½
(b)	Sold to milk collection centre	–	12,748
(c)	Converted into Curd	–	150
(d)	Converted into Ghee	–	25
	TOTAL :		47,200½ pints.

3. **Herd Strength**

	As at 84.01.01	*Births*	*Receipts*	*Deaths*	*Sold*	*Transfers*	*Balance As at 84.12.31*
Heifer calves	52	16	01	02	38	-3	26
Bull calves	21	11	01	03	11	—	19
Cows	41	–	01	–	13	+3	32
Bulls	02	–	01	–	01	—	02
Total :	116	27	04	05	63	0	79

REPORT OF THE ADMINISTRATION DIVISION

J.M.D. Jayaweera, Deputy Director (Adm. & Fin.)

CADRE

The staff of the Coconut Research Board at the end of December, 1984 was as follows:

Grade	*On Contract*	*Special Class*	*Class I*	*Class II*	*Class III*	*Class IV*	*Ungraded*	*Total*
Executive	01	02	03	10	23	12	–	51
Technical	–	07	04	44	–	–	–	55
Intermediate	–	–	06	11	–	–	–	17
Clerical	–	04	11	33	–	–	–	48
Operative	–	03	10	33	–	–	–	46
Minor	–	19	74	89	–	–	–	182
Driver	–	02	08	20	–	–	–	30
Watcher	–	--	–	–	–	–	26	26
Total	01	37	116	240	23	12	26	455

PROMOTIONS AND NEW APPOINTMENTS DURING THE YEAR:

Internal :

Internal Promotions have not been made during 1984.

New Appointments :

Mr. J.M.D. Jayaweera, Deputy Director (Adm. & Fin.) seconded for service with effect from 09.03.1984.

Mr. J.E.A. Dalpathado, Chief Clerk to Executive Grade, Class IV as Office Assistant with effect from 16.03.1984.

Mrs. T.M.H. Fernando, Stenographer to the Board to Executive Grade, Class IV with effect from 16.03.1984.

Mr. D.G. Manamudali, Assistant Accountant, Executive Grade, Class III with effect from 01.06.1984.

Mr. D.R.C.M. Hendalage, Accountant, Executive Grade, Class II with effect from 16.07.1984.

Mr. P. Kariyawasam, Seed Production Officer, Executive, Class III with effect from 15.10.1984.

Mr. S.M. Athukorala, Foreman (Mechanical), Technical Grade, Class I with effect from 15.02.1984.

The following were appointed as Tractor Drivers (Driver Grade, Class II) with effect from 01.11.1984.

Mr. E.M. Subasinghe
Mr. M.A. Sarath Dharmasiri
Mr. W.L.S.S. Fernando
Mr. T.M. Chandrasena Peiris
Mr. K.R.E. Malraja Fernando
Mr. E.A. Jayatilleke
Mr. M.A. Marcus Fernando
Mr. H.M. Jayatilleke

2. **Retirements, Resignations and Deaths :–**

Retirements :

Mr. J.E. Premaratne, Lab. & Field Attendant, Coconut Processing Division with effect from 05.02.1984

Mr. W.J.B. Tissera, Electrician/Power House Operator, Engineering Division with effect from 31.07.1984.

Mr. R.K. Gunatilleke, Garden Labourer, Engineering Unit with effect from 04.11.1984.

Mr. J.A. Piyadasa, Garden Labourer, Engineering Unit with effect from 04.11.1984

Resignations :

Mr. K.D.L. Dharmasiriwardena, Clerk, Accounts Division from 02.01.84.

Mrs. H.R.N. Perera, Clerk, Library from 15.02.1984.

Mr. W.M.M.J. Perera, Foreman (Workshop) Engineering Unit from 28.03.1984.

Mr. Herath Samarasinghe, Office Attendant, Internal Audit Unit from 26.04.1984.

Mr. Athukorala, Foreman (Mechanical) Engineering Unit from 01.10.1984.

Mr. A.J.B. Nimal Fernando, Lab. & Field Assistant, Biometry Division from 17.05.1984.

Mrs. L.C. Nanayakkara, Library Assistant, Library from 08.05.1984.

Mr. K.S.O. Perera, Experimental Officer, Soils & Plant Nutrients from 31.05.1984.

Mr. W.D.P.A. Nobert, Research Assistant, Coconut Processing Division from 01.08.1984.

Dr. S. Mohandas, Head/Coconut Processing Research Division from 01.08.1984.

Mr. P.G.F. Fernando, Clerk, Accounts Division from 13.08.1984.

Mr. A.T. Fernando, Lab. & Field Assistant, Estate Management Division from 04.11.1984.

Dr. G. Randeniya, Research Scientist, E.C.R.D. from 31.10.1984.

Mr. D.C. Ellawala, Superintendent, Estate Management Division from 01.11.1984.

Mr. P.J.E. Fernando, Lab. & Field Assistant, Soils & Plant Nutrient Division from 01.12.1984.

Mr. W.P. Titus Perera, Lab. & Field Assistant, Division of Genetics and Plant Breeding from 12.12.1984.

Mr. V.R.K.S. Perera, Research Assistant, Division of Genetics & Plant Breeding from 14.12.1984.

Deaths :

Mr. W.W. Ridley Fernando, Lab. & Field Assistant died on 21.02.1984.

3. TERMINATION OF SERVICES AND VACATION OF POSTS :

Termination of Services :

Mr. G.G. De Silva, Assistant Administrative Officer, Establishment Unit with effect from 14.01.1984.

Mr. S.A. Ranjith, Research Assistant, Division of Agronomy with effect from 14.01.1984.

Vacation of Post :

Mr. B.G.S. Dissanayake, Assistant Manager (Farms) E.C.R.P. with effect from 16.08.1984.

Mr. S.A. Shelton, Conservancy Labourer, Engineering Unit with effect from 28.06.1984.

WELFARE :

a). MPCS :

The C.R.I. multipurpose co-operative Society catered to the needs of the staff in supplying essential articles including food stuffs and materials. The Board has contributed an annual grant of Rs. 1500/-.

b). Financial Aid :

The following amounts were given out as loans during the year.

i). Provident Fund :

A sum of Rs. 1,043,586.00 as provident fund loans and Rs. 9,734.81 as provident fund insurance premia.

ii). Distress loans :

A sum of Rs. 666,867.00

iii). Transport :

A sum of Rs. 31,200.00 was paid as transport loans.

MAINTENANCE WORK

The Engineering Unit has maintained all the office buildings, labs, bungalows, labour cottages and all other types of buildings at Bandirippuwa Estate and the following sub stations.

Passikudah Demonstration Farm
Uhana Demonstration Farm
Minneriya Demonstration Farm
Ambekelle Research Station
Pothukulama Research Station
Ratmalagara Research Station
Walpita Research Station
Dunkannawa Processing Centre

Dambuwa Mukalana Intercropping Centre
Mahayaya Seed Garden and
Kirimatiyana Estate

a) **Office Buildings at Bandirippuwa Estate.**

- Administrative Section, including Engineering, Accounts and Stores.
- Tissue Culture Lab.
- Coconut Processing Research Division
- Soils and Plant Nutrition Division
- Genetics and Plant Breeding Division
- Agronomy Division
- Crop Protection Division and Insectry
- Biometry Unit
- Estate Management Division
- Publicity/Publication section and Library.

b). **Bungalows at Bandirippuwa Estate.**

Executive Grade Bungalows	6 Nos.
Assistant Staff Bungalows	20 Nos.
Minor Grade Staff Bungalows	8 Nos.
Labour cottages	14 Nos.
Labour lines	6 Nos.
Total	54 Nos.

Coconut Development Authority has constructed the following buildings under the Asian Development Bank Programme and was handed over to the Coconut Research Institute.

Grade 5 Bungalows	6 Nos.
Grade 4 Bungalows	10 Nos.
Grade 3 Bungalows	24 Nos.
Grade 2 Bungalows	12 Nos.
New laboratory	1 No.
Total	53 Nos.

There are other three main projects undertaken by CDA, remaining under construction and will be completed very soon.

a). Internal telecommunication system (PABX)

b). New water supply scheme at Bandirippuwa Estate.

c). The new Electricity scheme at Bandirippuwa Estate and the training centre.

Construction

The following buildings and construction works undertaken by the Engineering Unit were duly completed.

A). Bandirippuwa Estate

1.	Stores for Tissue Culture Lab	Rs. 103,480.75
2.	Repairs to roads	Rs. 75,245.52
3.	New road way to the main buildings	Rs. 34,414.40
4.	Carpentry work shop	Rs. 9,663.00
5.	Office partitioning CPRD	Rs. 6,475.00
6.	Board Room Carpeting	Rs. 42,060,00
7.	Wooden Racks for Tissue Culture Lab.	Rs. 29,750.00
8.	Lorry Body Building	Rs. 84,250.00

B). Dunkannawa Processing Centre

1.	Office Building	Rs. 187,713.09
2.	Electricity Extension	Rs. 44,687.50
3.	Ground level water tank (22,500 leters)	Rs. 44,605.20
4.	Watch Hut	Rs. 13,518.85
5.	Trusses for timber workshop	Rs. 81,250.00

C). Ratmalagara Research Station

1.	15 x 10 Store Room	Rs. 26,009.50
2.	Toilet	Rs. 11,031.50

D). Pothukulama Research Station

1.	Construction of a Grade 2 Bungalow	Rs. 80,679.15

E). Dambuwa Mukalana (IRPD)

1.	Over head water tank (5400 litre)	Rs. 37,361.60
2.	Grade 2 bungalow extension	Rs. 49,473.81

F). Minneriya Demonstration Farm

1.	Generator Room	Rs. 29,183.50
	Total	Rs. 990,852.37

The other works that have been undertaken by the Engineering Unit in 1984, and not fully completed due to unavoidable reasons are appended bellow.

Bandirippuwa Estate

TTTS building renovation for section	Rs. 425,415.00
Installation of air conditioning plants and partitioning work (Board Room)	Rs. 195,365.00

Dunkannawa Processing Centre

Timber work shop	Rs. 257,464.52
Over head water tank (5,400 litre)	Rs. 33,453.50

Walpita Research Station

Labour rest room	Rs. 34,517.40
Office/Garage	Rs. 32,501.65
Grade 2 Bungalow	Rs. 78,665.20
Total	Rs. 1057,382.27

The following expenditure have been incurred under the maintenance of office and buildings in 1984.

Building upkep	Rs. 545,887.37
Office upkeep	Rs. 11,752.89
Total	Rs. 557,640.26

MECHANICAL SECTION

The Institute has purchased three new vehicles to the pool in 1984.

Toyota Cresida Cars	2 Nos.
Nissan Patrol Van	1 No.

The following vehicles were maintained under the machanical section.

Issusu Lorries	3 Nos.
Tata Lorries 1210 SE	3 Nos.
Mitsubishi Jeep	8 Nos.
Land Rover Jeep	6 Nos.
Issusu 250 Van	1 No.
Mitsubishi Fuso Bus	1 No.
Issusu Mini Bus	1 No.

Dhihutshu Jeep (IRPD)	1 No.
Volxvagon Van (Lab)	1 No.
Mitsubishi Pajaro	1 No.
Peogoeut 504 Car	1 No.
Ford Cortina (1.6) Vagan	3 Nos.
Toyota Cresida Cars	2 Nos.
Toyota Hiase Van	1 No.
Nissan Patrol Van	1 No.
Motor Cycles (Honda)	3 Nos.
Motor Cycles (Yamaha)	8 Nos.
Motor Cycles (Kavasaki) (CDA)	1 No.
Tractor—Massy Ferguson	13 Nos.
Tractor— David Brown (CDA)	1 No.
Tractor Trailors and bowsers	16 Nos.
Total	76 Nos.

In addition to these vehicles, the repairs and the normal maintenance work of the two wheel tractors and the water pumps attached to Agronomy Division and Estate Management Division were also undertaken by the Machanical Section.

Two vehicles were condemned and sent for sale in auction.

7 Sri 9430 Ford Cortina Vagan and
5 Sri 700 Mitsubishi Jeep.

The expenditure incurred during the year is as follows.

Fuel	Rs. 1027,205.25
Repair works	Rs. 622,994,79
Insurance	Rs. 48,203.14
Travelling	Rs. 215,349.05
Renewal of licence fees	Rs. 60,066.00
Total	Rs. 1973,818.23

ELECTRICITY SECTION

The following works at Bandirippuwa were commenced under the Asian Development Bank Programme.

a). Installation of 400 KVA transformer in place of a 75 KVA one to supply electricity according to the present requirements.

b). Rewiring of office buildings, labs, and the residential houses.

c). New over head water tank with a capacity of 25,000 gallons and the distribution lines.

d). New intercom system (PABX).

e). Extension to Electricity work shop.

The maintenance of Electricity schemes and water supply at Bandirippuwa and all other remote stations were handled by Electrical Section. In addition to that the Electrical Section has undertaken the maintenance and repair works of other Electricity equipments and machines at various divisions of the institute and it's substations situated at different districts.

The expenditure incurred for Electricity and water supply, upkeep was Rs. 937,486.92.

STAFF

The Engineering Unit consisted of the following staff.

Officer-in-Charge Engineering Unit	1
Electrical/Machanical/Building Foremans	3
Draughtsman	1
Clerk/Typists, Clerks	4
Senior Machanic	1
Building Caretaker	1
Electrician/Plumber Fitter/Power House Operator	9
Motor Machanic	1
Carpenters	1
Machanic Helpers	2
Office Attendents	6
Tinkers	1
Building Labourers	3
Drivers	29
Lorry Cleaners	6
Scavengers	2

REPORT OF THE COCONUT INFORMATION CENTRE

Project Leader – M.J.C. Perera

GENERAL

The first phase of the International Development Research Centre (IDRC) funded Coconut Information Centre (CIC) terminated in January 1984 and a project proposal for the second phase assistance was submitted to the IDRC for consideration. The Centre continued all its services very satisfactorily during the year under review.

STAFF

Position of the CIC staff as at 31st December 1984 was as follows. Project Leader (1), Documentation Officer (1), Documentation Assistant (1), Library Assistant (1), and supporting staff (1). Mrs. H. R. N. Perera (Clerical Assistant) and Mrs. L. C. Fernando (Library Assistant) resigned from their posts with effect from 15.02.1984 and 08.05.1984 respectively. These two posts remained vacant for rest of the year. Further, the services of one Library Assistant, one Machine Operator and one supporting staff were provided by the Coconut Research Institute.

TRAINING

Mr. D. B. Jayasinghe, Documentation Assistant, successfully completed a training course on abstracting, keyword selection, maintaining of Selective Dissemination of Information (SDI) profiles and preparation of special bibiliographies at the Central Food and Technological Research Institute (CFTRI), Mysore, India for a period of 8 weeks commencing from 07.01.1984.

Miss. T. I. I. Peiris, Library Assistant, participated in one day workshop conducted by the Natural Resources Energy and Science Authority of Sri Lanka to familiarise the Cataloguers on preparation of input sheets for the Union Catalogue of Scientific and Technical Books, on 06.04.1984.

MISCELLANEOUS

Visitors – The Centre had 53 visitors, local and foreign including Research Scientists, students and industrialists during the year. Her Excellency Olga Chamera, the Ambassadress for Cuba accompanied by Hon. Harold Herat, Minister for Coconut Industries paid a visit to the Centre during her visit to the Institute on 9th April 1984.

SERVICES

Information collection & Storage – Collection of information by way of journal articles and reprints from authors continued satisfactorily throughout the year and all major abstracting services were used in this exercise. The centre has made 140 requests for literature from various sources and out of these about 72% have responded. During this year 275 items were processed for the storage and retrieval system.

Information Retrieval & Dissemination – Requests received for information from foreign as well as local scientists and others amounting to 55 were successfully responded to, by providing subject bibliographies and photocopies of materials requested. Further nine new SDI profiles were opened up during the year for the Centre clients.

PUBLICATIONS

Annotated Bibliographical Series No. 16 – This series covering literature collected for the year 1982 was processed for publication. This service is being updated continuously through the current awareness service of the Newsletter.

Retrospective Bibliographical Series No. 3 – This series on diseases of coconut covering literature for the period 1900 - 1965 has been prepared for publication.

Newsletter – As at 31.12.1984 there were 727 recipients of the newsletter registered with the Centre. This newsletter also serves in updating the International Directory of Coconut Research Workers. News Items relating to development programmes, research findings from many coconut growing countries appeared in all four issues published during the year. Further, 213 references to literature on coconut appeared under the Current Awareness Service.

Other Publications – Proceedings of the Workshop on "Coconut Information Networking" was published and circulated among the participants and other organizations concerned. As requested by the participants of the above workshop, the Coconut Information Centre prepared the "Framework of Operation" for the proposed coconut information network and submitted to the authorities concerned for their views and comments.

In addition to the printing of the Centre publications, a considerable amount of printing work was done for the Institute in the form of advisory leaflets, programmes and other miscellaneous items.

EAST COAST REHABILITATION PROJECT

R. Mahindapala, Ph.D

Work of the three farms established under the East Coast Rehabilitation Project could not be carried out on schedule due to various reasons.

Most of the staff had to be withdrawn from the Passekudah Farm due to the unsettled conditions in the Eastern Province. Data collection, scheduled for the latter part of the year, could not be accomplished as the farm could not be visited by officers from the Head Office. Instructions to the farm staff had to be essentially through correspondence, and the progress of the activities could not be reviewed physically.

The general performance and growth of seedlings in the experimental areas were reported to be very satisfactory. The fertilizer trial of the soils and Plant Nutrition Division (No. 7.2) was concluded, and the results would be available very soon.

At the Passekudah Farm, work on a new house commenced. Also, the construction of the office/store was in progress.

At the Minneriya Farm, work could not progress on schedule due to lack of water. The contractors entrusted with the task of developing water sources defaulted. Potable water for the staff had to be transported from outside the farm. The coconut plantation suffered badly due to regular visits by wild elephants. By the end of the year, about 125 seedlings were lost.

At the Uhana Farm, similar difficulties were encountered due to lack of water. The Water Resources Board was commissioned to investigate the potential sites for wells. Their survey has revealed that tube wells in the farm could be of very low yield and therefore uneconomical. The recharge rate of dug wells was about 150g/day, which was very inadequate. The Coconut Research Board decided to terminate activities of this farm as no useful research or demonstration work in the cultivation of coconut or its intercrops could be carried out successfully due to lack of water. It was decided to hand over the farm to the Coconut Cultivation Board.

An area of approximately 85 ha was demarcated in Mahaweli System 'B', Block 104 for the purpose of establishing a Coconut Seed Garden to produce Tall x Tall (CRIC 60) variety. The assistance of the Land Use Division of the Irrigation Department was obtained for soil survey data. The predominant soil series in this land is the Wilayaya Series (Reddish Brown Earth). The land was taken over from the Mahaweli Authority, and surveyed.

Arrangements were made to obtain the services of a Contractor to clear the jungle.

1. **CRI Research and Demonstration Farm, Passekudah, Kalkudah.**
Asst. Farm Manager, A.Thavaratnarajah.

General

Recruitment and retention of staff remained a major problem. The Officer-in-Charge, Mr. B. G. S. Dissanayake left the services on 3 August 1984. Mr. K. P. de Silva, A.F.M. assumed duties on 27 October, but reverted to Minneriya Farm on 3 December, 1984 due to terrorist disturbances in the area. At the same time, Mr. M. Leelaratne, Administrative Asst. was temporarily transferred out of the Farm.

Dr. G. Randeni, Research Scientist, left the services in October, at the end of the contract period. By the end of the year, the only permanent employees left at the station were Mr. A. Thavaratnarajah, Asst. Farm Manager and Mr. K. Pariasathan, Driver.

The farm recorded unusually high rainfall during the year.

AREA STATEMENT

	Ac	*R*	*P*
Extent of the land	117	–	19
Distribution of area			
Fertilizer Trial	30	–	–
Evaluation of cultivars	06	–	–
Irrigation Trial	04	2	–
Shade cropping & Mulching Trial	02	1	–
Drought Tolerant Trial	05	–	–
Coconut Varieties	01	–	25
Coconut between 5 to 10 years	07	–	–
Coconut (non-experimental)	24	–	–
Horticultural Crops	02	–	–
Mango Plantation	02	–	–
Cashew Plantation	03	–	20
Buildings/Quarters	05	–	–
Rocks	03	1	29
Road	04	–	17
Short Term Crops (Maize)	02	2	–
uncultivated	15	–	08
Total	117	0	19

Census of Palms

	Field "A"	*Field "B"*	*Field "C"*	*Field "D"*
Bearing Palms	–	–	40	03
Young palms 2 - 3 years	663	2076	783	1311
Vacancies	39	–	34	51
Total	702	2076	857	1365

Rainfall

	1982	*1983*	*1984*	
	mm	*mm*	*mm*	*Wet days*
January	12	40	373	18
February	0	0	629	16
March	43	0	92	8
April	27	14	193	13
May	20	16	0	0
June	0	90	0	0
July	5	40	146	5
August	0	20	55	5
September	19	40	81	7
October	140	55	99	3
November	492	140	811	22
December	442	540	161	8
Total	1200	995	2640	105

ACTIVITIES

Field 'A'

Horticultural Crops

The following crops were maintained.

Pineapple	Papaya
Grapes	Passionfruit
Banana	Citrus
Soursop	Guava
Pomegranate	Mango
Cashew	

All cutural practices were carried out as necessary. During May/June, crops were irrigated. Except for Mango and cashew, other crops are in yield. Towards the end of the year, Mango started to flower.

All passion fruit vines died due to virus disease in June. The total expenditure for the year was Rs. 13,154.85. Income amounted to Rs. 17,859.02.

Six hundred and twenty seven coconut plants were maintained satisfactorily. Each palm received 15 kg of cattle manure. Sun hemp was established in about three acres.

Twenty two seedlings, raised from seednuts from palms apparently resistant to the coconut caterpillar, were also planted in this area. The seednuts were supplied by the Crop Protection Division.

Field 'B'

4½ ac Block – Adult plantation.

Vacancies	*Watering*	*Manuring*	*Weeding*
None	Once in two weeks (May/June) 45 l /palm	Once a year (Cu_3)	Once in two months.

Fertilizer trial (54 plots; 12 plants/plot)

This trial was concluded by the Soils and Plant Nutrition Division in July.

Field 'C'

Irrigation trial

This trial was maintained satisfactorily. Appropriate phytosanitory measures were taken to prevent Black Beetle and termite damage. Four plants in the control plot (which received no irrigation) died. Cattle manure was applied to seedlings at the rate of 15 kg/seedling. A pipe line was installed to irrigate the seedlings.

Mulching trial

This trial was maintained satisfactorily. Plants mulched with Salvinia appeared most promising. No casualities were observed.

Shade cropping trial

The trial was maintained as required. Casuality was very high where Ipil-Ipil was planted as the shade crop. Roots of Ipil-Ipil were found in the coconut seedling hole, and the resulting competition for moisture is thought to cause the mortality in coconut.

Shade crop	*No. of coconut seedlings*	*Casualities*	*Irrigation*
Ipil-Ipil	35	32	30 1/two weeks
Castor	58	Nil	- do -

Coconut varieties

The eight coconut varieties established in 1983 performed well without any casualities.

Ordinary Tall	—	13 plants
Tall x Tall (CRIC 60)	—	10 plants
Dwarf x Tall (CRIC 65)	—	10 plants
Dwarf Red	—	11 plants
Dwarf Yellow	—	11 plants
Dwarf Green	—	10 plants
Gon Thambili	—	15 plants
Thambili	—	11 plants

Pasture and legume demonstration plots

The pasture and legume plots were maintained as required. All except *Stylosanthus* and *Calopogonium* performed satisfactory.

Field 'D'

Drought tolerant trial

No casualities were observed. The plots were maintained satisfactorily.

Evaluation of cultivars trial

(Open Pollinated tall; Dwarf x Tall)

This trial was maintained satisfacorily. All cultural practices were carried out as recommended. Special precautions were taken to prevent Black Beetle damage. Ipil-Ipil plants were established in alternate rows, and maintained by regular lopping.

Flowering was first observed in a Dwarf x Tall palm on 23 March, 1984. During the year further two plants flowered.

Miscellaneous

Under the prevailing difficult conditions, every attempt was made to keep the farm in good order. General weeding was done in all the fields. Field roads were maintained satisfactorily. A field day was held at the Farm in 13 January for the members of the District Agricultural Committee, Batticaloa. A meeting of the DAC, presided by the Govt. Agent Batticaloa preceded the field day. The Coconut Research Board held a meeting at the farm on 15 July. The Chairman of the Agricultural Development Authority, Mr. R. Wijeratne, visited the farm on 28 January.

2. CRI Research & Demonstration Farm, Uhana

Field Assistant – A. S. M. Premalal

General

In the absence of adequate water for the activities of the farm, development work was suspended. The Farm Manager, Mr. U. L. P. A. Perera was transferred to the Head Office on 3 March. Mr. A. S. M. Premalal's services were loaned to the farm from 28 February.

Trials

The plant density trial (956 seedlings) was maintained with difficulty. Drought killed 23 plants. Appropriate phytosanitary precautions were taken to minimize damage to seedlings by the Black Beetle and *Sophrops sp.*

3. CRI Research & Demonstration Farm, Minneriya.

Field Assistant – A. Jayatilake.

General

Water remained a major problem at the Farm. No developmental work could be undertaken because of this. Mr. Piyadasa de Silva, Asst. Farm Manager was transferred out of the Farm on 26 October.

Every attempt was made to maintain the observational trial on the evaluation of cultivars. About 125 seedlings were destroyed by wild elephants. Rainfed cultivation of Paddy (5 ac), maize (3 ac) and other short-term crops was carried out.

COCONUT DEVELOPMENT PROJECT

R. Mahindapala, Ph.D

The Coconut Development Project (CDP) was launched in 1982 by the Coconut Development Authority with the financial assistance from the Asian Development Bank (ADB) and the International Fund for Agricultural Development (IFAD). Besides improving production in an area of 160,000 ha of small holder farms, the project provides for upgrading infrastructural facilities on coconut research, extension and marketing and for modernizing the coconut processing sector.

Research Support

The following staff houses were completed.

6 Nos.	–	Senior Research Staff houses
10 Nos.	–	Research Staff houses
18 Nos.	–	Support Staff houses
18 Nos.	–	Minor Staff houses.

It is expected that water and electricity service connections to these houses would be given in early 1985. The construction of a laboratory building was nearly completed. The progress of work had been slow.

The items of civil work undertaken by the Coconut Development Project are as follows:

(i) Construction of 100,000 l overhead water tank, provision of new water sources and a reticulation system.

(ii) Augmentation of electricity supply at Bandirippuwa estate and replacement of overhead and building wiring.

(iii) Supply of a PABX system.

The work relating to the above items progressed slowly and behind schedule. At the end of the year, about 75% of the work had been completed. Items (i) and (ii) are supervised by the State Engineering Corporation of Sri Lanka, Consultants.

Irrigation System – Isolated Seed Garden, Ambakelle.

Although civil work relating to the above project, funded by the Coconut Development Project, was completed, the system was not commissioned. The flexible hoses also were not available.

Certain defects in the system were observed, and the Coconut Development Authority had not been able to get the services of their Consultant to attend to the defects. The Coconut Research Institute was requested to rectify the defects and commission the system.

Towards the end of the year, preliminary arrangements were made to select another consultant for this work.

MAKANDURA SEED GARDEN

1. Introduction

The activities of the Seed Garden commenced with the informal taking over of the land of 144 ac from the Mahayaya estate of the Coconut Cultivation Board on 21 October 1983 During the rest of the year, removal of old palms and land preparation were carried out.

The Seed Garden was designed with a barrier of 13 rows of coconut, around the seed garden proper. On this design, the seed garden proper was to be about 85 ac in extent with the rest constituting the barrier.

The Seed Garden was designed to produce the Tall x Tall variety (CRIC 60), and arrangements were made to commence planting the Seed Garden proper.

Planting commenced during the first quarter of 1984. The Seed Garden was formally inaugurated on 21 July, 1984 by the Hon. Harold Herat, Minister of Coconut Industries and the Deputy Minister for Janatha Estate Development in the presence of the Hon. Gamani Jayasuriya, Minister of Agricultural Development and Research, the Hon. Gamini Jayawickrama Perera, District Minister for Kurunegala and the M.P. Katugampola and other distinguished guests.

1.1 Staff

The staff position is as follows:

Mr. K.R.L.A. Perera, Officer-in-Charge
Mr. E.M. Subasinghe, Tractor Driver (from 13 Nov. 1984)

Mr. H. M. Kirihamy, driver was transferred to the Head Office with the appointment of Mr. Subasinghe.

2. Field Operations

2.1 Land clearing

A total of 7491 palms of all ages were uprooted. In addition, 1332 old boles were also removed and destroyed. Proceeds from the sale of 2685 mature palms were remitted to the Coconut Cultivation Board. Towards the end of the year, a contract was awarded to uproot a further 1600 palms in the barrier area. This work was in progress at the end of the year.

2.2 Planting

Planting of the Seed Garden proper was completed in November. The area was found to be 81½ ac. The details of planting are given in Table 1.

The planting holes were dressed with 1 kg dolomite, 1 kg common salt and 25 kg of goat dung.

Table 1. *Planting Details*

Field No.	*Extent (ac)*	*No. of seedlings*	*Planting distance (m) and system*	*Planted in*	*Planting material*
1	16	1191	8 x 8 x 8 (triangular)	September	Tall x Tall
2	23½	1739	-do-	November	-do-
3	16½	1337	7.6 x 7.6 x 7.6 (triangular)	March	Tall x Tall (Ambakele special)
4	25½	2048	-do-	July	Tall x Tall
TOTAL	81½	6315			

2.3 Fertilizer

Seedlings in Field Nos. 3 and 4 were given the Young Palm Mixture at the rate of 500 g per seedling.

2.4 Other field operations

Heavy weed growth at the time of taking over was cleared. A total of 17133 coconut squares (in three rounds) were cleared of weeds. Weed growth around the seedlings was also cleared.

A new fence of 940 m was erected on the northern boundary of the seed garden.

The main estate road was consolidated with 20 cubes of gravel. A further 6000 m (several cycles) of secondary roads were maintained satisfactorily.

Husk trenches were established around 1250 seedlings.

In the low lying area about 250 m drainage drains were opened up to remove excess water from the plantation. Existing drains (about 2500 m) were desilted and cleaned.

All seedlings were mulched. In addition, about 300 seedlings in Field No. 3 and 4 were mulched with coconut husks.

Seedlings in the entire plantation were irrigated during the dry period using water transported by bowser from Maha Oya

2.5 Nursery

A nursery was established to raise seedlings for planting the Seed Garden. This was convenient and less expensive than transporting poly-bagged seedlings from the nursery at the Isolated Seed Garden, Ambakelle, where the seedlings were originally raised in anticipation of planting at Makandura.

A total of 12,500 seednuts were planted in the prenursery as follows:

for planting in October/Nov, 1984	—	5500 seednuts
for planting in May/June, 1985	—	7000 seednuts

2.6 Old Stand

The harvest from the remaining 38 ac of the old plantation is as follows:

4th pick, 1984	—	8,226 nuts
5th pick, 1984	—	7,925 nuts
6th pick, 1984	—	2,340 nuts
Total	—	18,491 nuts

3. Problems

The building programme could not be commenced as the necessary approval could not be had from the Project Implementing and Monitoring Office. Wells could not be dug due to the same reason.

Water for irrigation had to be transported from Maha Oya using a bowser, which seriously limited the extent and frequency of irrigation. Also, the only tractor available had to be used for the transport of water, limiting its use for other agricultural operations. If not for the relatively favourable weather during the year, the mortality could have been significant.

The planned improvements to the tank could not be undertaken due to lack of funds. This work should be undertaken on a priority basis so that an adequate supply of water would be available in future for irrigation.

Six labour families working in Mahayaya Estate of the Coconut Cultivation Board continue to occupy the labour quarters situated within the Seed Garden.

The tractor supplied to the Seed Garden by the Project is an uncommon make in Sri Lanka. While the tractor was under repairs in the local agent's workshop, the agents were liquidated. The tractor is lying in the closed workshop in a dismantled condition. In order to continue the field operations without a disruption, the tractor of the Uhana Farm of the East Coast Rehabilitation Project was loaned to the Seed Garden.

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